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THE AGRICULTURAL STUDENT

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POULTRY AND HORTICULTURE NUMBER

CONTRIBUTORS

T. L. GUYTON
L. A. SUTERMEISTER
HERBERT H. KNAPP
FRED B. PITNEY

A. B. DANN
H. A. ALBYN
CHRIST R. GAISER
OSCAR V. BRUMLEY

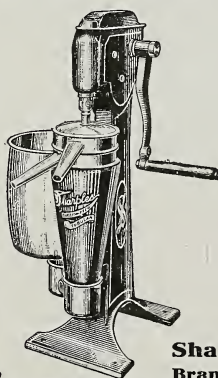
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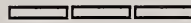
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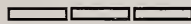
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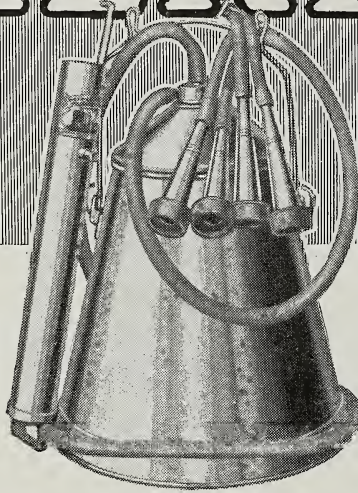
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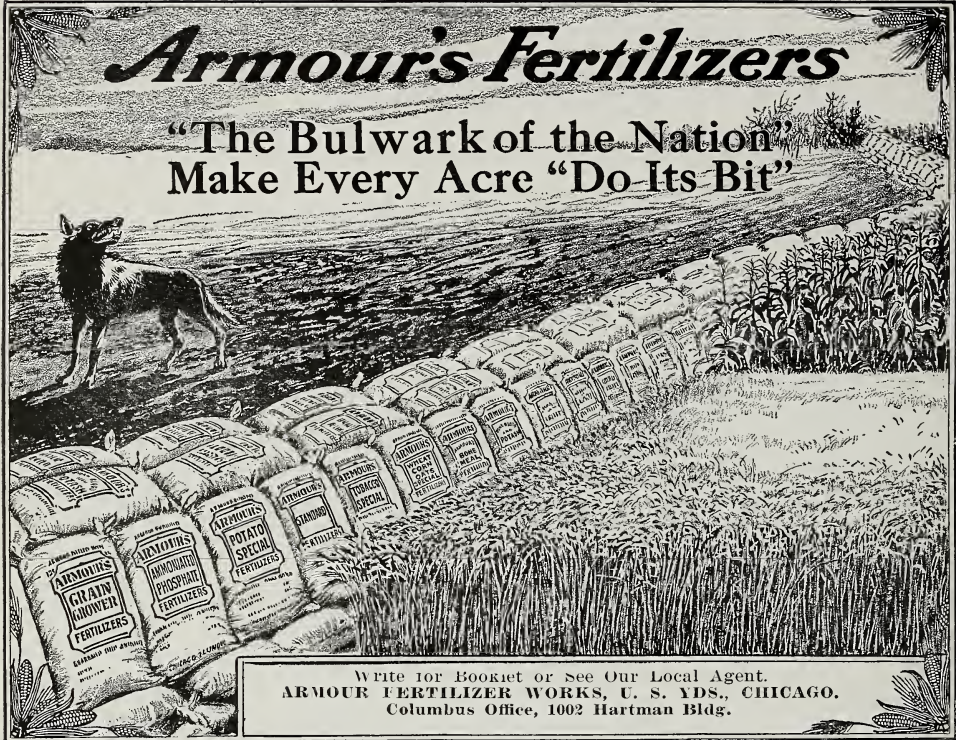
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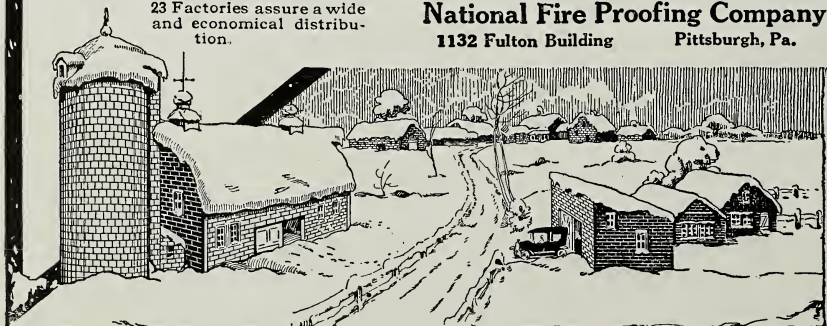
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Cotton Planters
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Corn Binders
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Grain Elevators
Corn Shellers
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Mountain Wagons
Trucks
Teaming Gears

It was to insure the permanency and merit of this Line that the John Deere family of factories was brought together under a permanent charter.

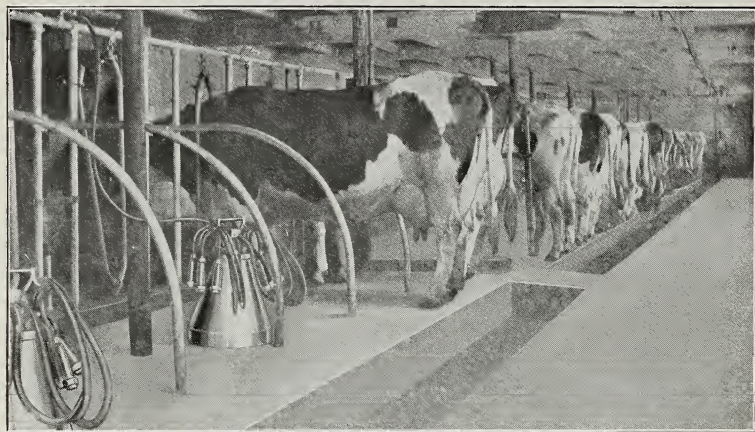
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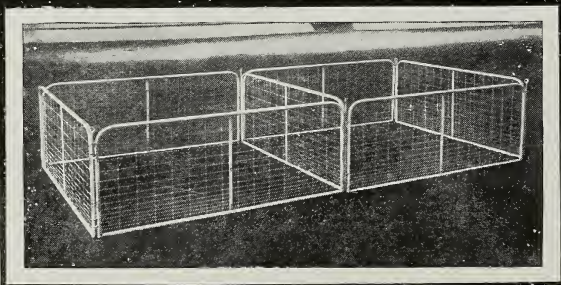
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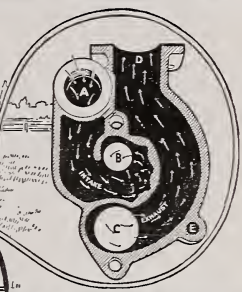
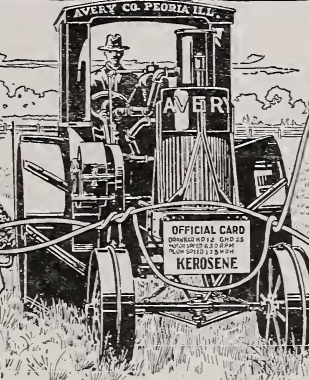
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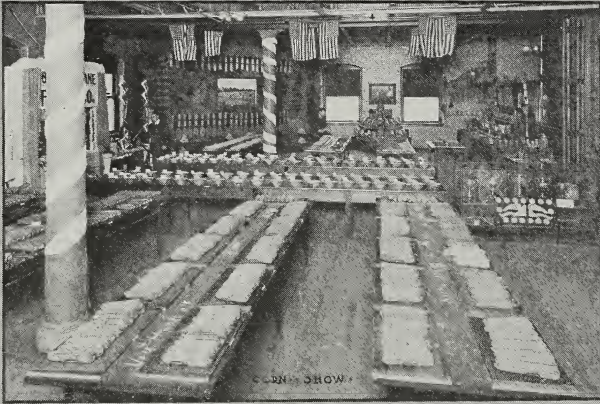
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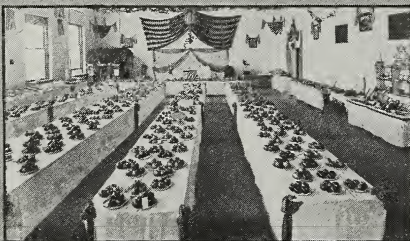
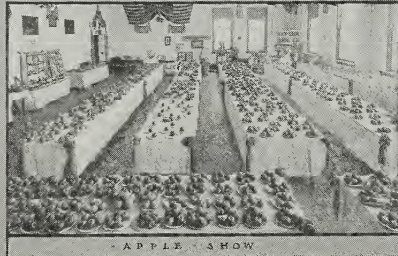


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Among the Ags



THE AGRICULTURAL STUDENT

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No. 5

SOME HARMFUL ORCHARD INSECTS IN OHIO

A Discussion of the Different Enemies of Fruits and Their Means and Methods of Attack; How Systematic Control Methods May Increase Profits of the Ohio Producers

THOMAS L. GUYTON, Ohio Agricultural Experiment Station, Wooster, Ohio

INSECTS attacking orchard crops are responsible for enormous losses to the fruit growers of Ohio each year. This loss is due to the attack of these enemies upon the host tree itself by feeding upon the trunk, branches, roots, leaves and buds, or by injuring the fruit of the tree.

Borers Attack Entire Tree.

Injury to the trunk may be due to an insect, usually in the larval, or grub stage, entering the interior of the trunk and consuming a quantity of the host's tissue. Such insects are referred to as borers. Of these the Round-headed Apple Tree Borer ranks among the most destructive. Especially is this so of its attack on apple and quince. This insect occurs in injurious numbers in restricted localities of the state. Its presence is usually indicated by the leaves being small and yellow, giving the tree a sickly appearance. At the base of the tree may be found the sawdust-like castings of the working larva. The borers work close to the ground and sometimes may be found in the larger roots of the host tree.

Another borer which is a more general feeder is the Flat-headed Borer. These borers attack their hosts in much the same way. The round-headed borer penetrates deeper into the trunk, while the flat-headed borer feeds in

the sapwood. The round-headed borers attack apple, pear and quince, while the flat-headed borers attack these and plum, peach, and currant, as well as many of the forest trees.

The Orchard Beetles or Shot-hole Borers are small beetles the grub forms of which feed under the bark in the sapwood, forming many anastomosing galleries diverging from one central gallery which is larger than the others. In the advanced stages of infestation numerous holes about the size of a pinhead appear thru the bark. When these holes appear the tree has been killed, at least in part, by the pest. The early stages of infestation are not noticeable to any extent. The host plants are plum, peach, cherry, apple and pear.

On the trunks of peach trees, just under the surface of the ground, at some seasons of the year may be found a gum-like exudation which has bits of brown excrement mixed with it. This is an indication of the attack of one of the most important enemies of the peach growing industry—the peach tree borer. The larval form of this moth feeds in the sapwood of the peach and at times may infest the cherry and plum in a like way. Another closely related species attacks the tree trunk above the ground surface, extending its

points of attack to the larger branches of the host tree. This insect is known as the lesser peach tree borer. The attacks are confined almost entirely to diseased and injured areas of the trunk and branches.

Twig-girdlers, apple twig borers, snowy tree crickets and seventeen-year-locusts, or cicadas, inflict damage to the smaller branches of fruit trees. The

have mouth-parts fitted for sucking the juices of the host plant. Woolly aphids may attack root, trunk and branches, while the scale insects attack trunk, branches, leaves and fruit.

The scale insects include some of the most important pests with which the fruit grower of Ohio has to contend. Several species are found in the state. The San Jose Scale has incurred losses



Spraying Lengthened the Life of This Forty-Year-Old Tree

last-named insect may do much harm to young orchards by the work of the ovipositing female in puncturing the small branches in egg-laying. The puncture is about one and one-half inches long and extends as deep as the heart of the twig. A limb when so injured is easily broken, and the injury of many such limbs may spoil the top of the young tree.

Attacks of Aphids and Scales.

Attacking the trunk and branches of the tree from the surface are the aphids and scale insects. All these

amounting to thousands of dollars to orchardists of the state since its introduction. The rate of reproduction is extremely fast in the scale insects and they are capable of soon covering the host tree when once they get a start. The San Jose scale is a general feeder on orchard trees, though affecting apple, peach, pear and plum most seriously.

Damage Due to Leaf-feeders.

Harmful orchard insects attacking the leaves and buds usually consume a part or the whole of the affected parts.

Leaf-feeding caterpillars, larval forms of some of the moths, together with the larval form of some saw-flies, are largely responsible for this form of injury. Bud moths are sometimes a pest in restricted areas in Ohio, especially where the usual spraying program is not carried out. The larval form destroys the developing bud. This form is especially harmful to apple. The spring canker worm, fall canker worm, white-marked tussock moth, fall webworm, apple-tree tent caterpillar, yellow-necked apple caterpillar and red-humped apple caterpillar, are leaf-feeding forms especially harmful in Ohio. At times any of them may be numerous enough to defoliate the host tree completely. Because of the small quantity of foliage on young trees the leaf-feeding forms of caterpillars should be carefully guarded against on such trees.

Those insects which attack the leaves and buds without consuming the tissue of the host, but take up the plant juices, are known as sucking insects. The leafhoppers, aphids and scale insects are of this kind. The leafhoppers may at times be so numerous as to do considerable harm; they are nearly always present in sufficient numbers to inflict some injury. Aphid injury to the leaves is noticeable by the curling of the leaves infested. In many instances small and distorted fruit results from such an attack. In years favorable for their rapid development, aphids inflict enormous loss to the fruit grower.

In the eastern states the Gypsy moth and the Brown-tail moth are important orchard pests, but thus far they have been successfully eradicated each time they were introduced in Ohio.

Damage to Orchard Fruits.

Orchard fruit which has been at-

tacked by insect enemies is usually rendered, in part at least, unfit for consumption as human food. The loss may be complete by the invading pest consuming the tissue of the fruit, or the attack may favor the entrance and growth of certain plant diseases within the fruit. Again, the presence of the attacking insect may cause the fruit to be inferior in quality. At all times the quantity is much less.

To the Ohio apple growers the codling moth is the most important fruit enemy to be controlled. Its annual toll reaches hundreds of dollars in orchards where a spraying program is not followed. This year in an orchard of 30 acres in northern Ohio a check tree which received no treatment for codling moth had as much as 57 percent of the crop infested, as shown by actual count. Probably something near this rate prevails in the unsprayed orchards of Ohio. The eggs of the codling moth are laid about two weeks after the petals of the apple bloom have fallen. The eggs are laid upon the leaves and sometimes a few are found on the twigs and fruit. The young may feed slightly on the foliage, but for the most part they go directly to the fruit, entering the blossom end in most cases. The larva feeds in the fruit for about three weeks, after which it goes toward the ground to find a suitable place to pupate. After spinning a cocoon the larva transforms into a pupa, which later changes into the winged adult stage. The insect has two or three generations each year. It spends the winter in the cocoon in the larval stage. The codling moth also attacks the pear and quince.

A native snout-beetle, the plum curculio, is a destructive pest to the fruit of plum, cherry, peach and apple, in both the adult and larval stages of its existence. This insect winters in the

mature, or adult stage, hibernating in sheltered places such as neglected orchards may offer. The adults come from their winter quarters about the time the leaf buds begin to unfold. These beetles feed upon the young leaves and fruit buds and later upon the young fruit. The female deposits her egg in a hole made in the young fruit by the use of her mouthparts. Around this puncture she makes a crescent-shaped slit which extends underneath the egg cavity. The young larva hatching from the egg burrows thru the flesh of the fruit and in case of the stone fruit goes as far as the pit, where it continues to feed. Infested fruit, except most varieties of cherries, fall to the ground before the grub matures. After reaching maturity the larval form leaves the infested fruit and enters the ground, where it transforms to the pupal stage and later changes to the adult stage. This insect is especially harmful to plums and cherries and is responsible for much of the loss due to wormy fruit in these crops. The punctures made by the adults admit the spores of the Brown Rot of stone fruits and undoubtedly the feeding adult carries these spores from one fruit to another. Other closely related species of *curculio* attack apple, quince and pear.

If present in any great numbers scale insects also attack the fruit of their host plant. Their presence on the fruit gives it an unsightly appearance and the quality of the fruit is less. Oftentimes malformation is caused by their attack. Other insects of the sucking-mouthpart type are the apple red bug and the green soldier bug. Rose chafers at times do considerable damage to the ripe fruit of the cherry. Fruit flies in the maggot stage damage the fruit of apple and cherry.

The foregoing list contains some of

the more important insect enemies of the orchard in Ohio. Many other insects do considerable damage in restricted localities each year. No doubt some insects, more or less inconspicuous at this time, will become of more importance, and those most troublesome now may become less troublesome due to control measures and to the growth and multiplication of their natural enemies.

Distinct Treatment for Each Class.

The control of the foregoing insects is first of all based upon the type of mouthparts which each one possesses. Insects which have biting or chewing mouthparts may in most cases be killed with a stomach poison. Insects which take their nutrition by sucking juices from the host are killed by bringing some material in contact with their bodies which will corrode the surface or close the breathing openings of the insects. Some chewing insects, such as the borers, feed within the tissue of the host. For such insects poisonous compounds are of little value in control. In fact, about the only method of combating borers after they have once entered a tree is to cut them out with a sharp knife. Certain preventive measures should be used, as that of making conditions about the orchard least favorable for the development of these insects. Clean culture and the removal and burning of old trees are general measures every orchardist ought to follow.

For the control of scale insects, when the trees are dormant, spray with lime-sulphur solution, miscible oil or some one of the dry sulphur compounds on the market. The first two are to be given the preference because their worth is well established. The lime-sulphur is to be used at about the rate of 1 volume of the commercial product

to 7 volumes of water. The exact rate of dilution of the commercial or home-made product can be told only by the use of an instrument called the hydrometer, which determines the density of the solution. The miscible oil is diluted at the rate of 1 volume of the oil to 15 volumes of water. The soluble sulphur compounds are used at the rate of from $12\frac{1}{2}$ to 16 pounds to 50 gallons of water.

For the control of the curculio, a pre-blossom spray is used. Arsenate of lead, 3 pounds of paste (or $1\frac{1}{2}$ pounds of the powdered product) to 50 gallons of water, in which 2 pounds of soft soap has been dissolved. Usually Bordeaux mixture and the soap are used in place of water to protect against fungous diseases.

This spray should be repeated just after the blossoms fall; to this spray nicotine sulphate, 1 volume to 500, may be added to prevent aphid attack. The Bordeaux mixture should be replaced by self-boiled lime-sulphur in solutions intended for trees with foliage which is easily burned by spray material.

The control of the codling moth is based upon the fact that the young larvae, for the most part, enter the fruit at the blossom end. When most of the

petals have fallen, the calyx-cup is up and open, and is easily filled with poison spray. At this time the first spray for codling moth should be made. The solution used is 3 pounds of paste arsenate of lead (or one-half this quantity of powder) to 50 gallons of a lime-sulphur solution prepared by diluting the commercial lime-sulphur 1 volume to 40 volumes of water. The application should be quite thoro. This spray should be repeated in about 7 to 10 days and a third application made between the middle of July to the 10th of August (earlier in the southern counties of the state and later in the northern counties). In the last spray, Bordeaux, or 1 to 40 lime-sulphur is used in the southern part of the state, while in the northern part of the state these fungicides are often omitted. When the program as given is followed out, leaf-feeding forms are usually destroyed without any additional application being made for their control. Some leaf-feeding forms may appear later in the season. These may be controlled by an arsenical spray. For complete instructions as to control measures the reader is referred to Bulletin 309 of the Ohio Agricultural Experiment Station, and the Monthly Bulletin for April, 1918, of the same Station.



A FEW COMMON POULTRY DISEASES

Symptoms and Treatment for Colds, Roup and Cholera

OSCAR V. BRUMLEY, College of Veterinary Medicine, Ohio State University

ALL species of poultry are affected more or less by various diseases. One of the greatest problems confronting the poultryman is in trying to keep his flock in a healthy condition. Where any number of birds are segregated in a limited space disease in some form is sure to appear sooner or later. The greater the number of birds kept in a limited space, or confined under abnormal conditions, the better opportunity for disease to appear, the more rapidly will it spread and naturally the losses will be greater. In the consideration of poultry diseases one of the most vital things is proper sanitary conditions. All poultrymen should make a comprehensive study of housing of birds, cleanliness and thorough disinfection of all premises at stated intervals. It has been observed that diseases among fowls can be materially reduced when proper sanitary surroundings are provided. Plenty of fresh air, sunlight, and pure water are important things to consider in keeping the flock in a normal healthy condition.

Colds (Coryza).

At this season of the year most all species of birds are affected more or less by sudden changes in temperature, and by exposure, resulting in colds, which are not serious except that the general resistance of the birds is lowered to such a degree that they are easy prey to other diseases. As a matter of fact poultrymen have associated colds generally with the disease, roup. This is an entirely separate condition and colds have no influence on this disease except in reducing the bird's resistance, making them more subject to the infection of the latter disease. Correct-

ing the abnormal conditions will be sufficient in eliminating the catarrhal condition (colds) from the flock.

Roup, (Swelled Head, Diphtheria)

This is one of the most prevalent poultry diseases and has caused enormous losses to poultrymen all over the United States. Investigation has proven that poultry in all sections of the country are affected by this disease in some form. In the United States roup is more prevalent, especially in the northern states, during the colder months. In the fall when the cold, damp weather begins, outbreaks occur quite generally, and poultrymen often refer to the early inception of the disease as a "cold." The intensity of the disease usually increases until the warm weather makes its appearance, when it diminishes and lies dormant, to reappear at the first cool, damp weather in the fall when the birds are more closely confined. There are a variety of ways by which natural infection takes place. Co-habitation is one of the most common, an infected bird introducing the disease into an entire flock. The exudate given off while sneezing or coughing acts as an intermediary carrier to the healthy birds. The infection in this way will find lodgment on the skin or mouth, where it develops either to form the pox lesions or the various other forms found on the mucous membranes.

It is quite possible to have the disease develop in the eyes by the infection gaining entrance, and the bird irritating the skin and conjunctiva by rubbing them against objects or by scratching them with their feet. The disease is frequently spread by food or

drink which is contaminated with infective material.

A common source of the disease is the poultry show where infected birds are exhibited, and conditions exist favorable to reduce the bird's resistance. It frequently happens that on the return of birds from the show the disease develops in the course of a week or ten days. Sparrows and pigeons are common carriers, often transporting the infection great distances.

This is an important method of trans-

of the disease will produce immunity for a certain period. Either the skin form or involvement of the mucous membranes confers equal immunity against the opposite form.

The disease assumes various forms, depending upon whether it involves the mucous membranes of the mouth, the nasal passages, the eyes, the intestinal tract, or the skin. It is necessary from a clinical standpoint to consider these various types of the disease. It is this fact which has led to so much confu-



Inoculating a Fowl for Roup

mission often overlooked. The disease has been observed in sparrows, exhibiting in them the same characteristics as in other birds. Sparrows and pigeons come in direct contact with poultry at feeding time and thus infect them. It is sometimes spread by such intermediary agents as infected coops and clothing. Young birds are more susceptible to the infection than older ones. Pigeons and chickens seem to be far more susceptible than other birds.

It has been observed that one attack

sion among the poultrymen, as they have been inclined to consider these forms separate diseases.

In previous articles which have been published in the various poultry journals we have tried to make clear the fact that the varied clinical manifestations are merely forms of one disease. A number of progressive poultrymen are beginning to realize this, as they frequently observe all the different forms at the same time in the same flock.

Nasal Passages.—The early symptoms are similar to those of an acute nasal catarrh, but the bird shows more dullness and prostration and there is present a peculiar offensive characteristic odor. The discharge from the nasal passages is at first thin, serous, and later becomes thicker and glutinous, causing the affected birds to sneeze and shake their heads in an effort to clear the passages.

The nasal secretions collect around the openings, forming dirty, yellowish crusts. The infraorbital fossae become inflamed and distended with pus, forming an enlargement on one or both sides of the head below the eyes. Owing to the occlusion of the nasal passages the bird breathes with open mouth.

The Eyes.—At first a thin serous secretion is observed flowing from one or both eyes, later it becomes turbid, thicker, adheres to the edges of the eye lids and dries to form crusts completely closing the eye. The retained yellow material becomes thicker and often accumulates to such an extent that it causes a pronounced bulging of the eye lids. Masses of this material as large as a walnut are often removed from beneath the lids. Sometimes infection develops back of the eyes in the form of abscesses which force the eyes partly out of their position. The cornea is turbid and often ulcerated. Complete destruction of one or both eyes is often observed in severe cases.

The Mouth.—Involvement of the mucous membranes of the mouth begins as a local disturbance. The disease is ushered in by a slight redness or congestion of isolated areas, or may involve the entire surface. In the center of the congested areas there will appear in a day or two small round or oval yellowish-white spots, which rapidly spread and eventually form extensive

collections of glutinous pus, having somewhat the appearance of diphtheritic membranes. The nature of the collected material on these areas led to the name "diphtheria" for this form. As the disease progresses, this process often extends over the entire mucosa of the mouth, tongue and throat. When the larynx is involved, or even the trachea as is occasionally noted, there will be marked symptoms of dyspnea. Asphyxia is frequent when the lesions extend to the larynx and trachea. On removal of the deposits the mucosa presents a red, granulating surface, which bleeds easily, showing in some cases extensive submucous swelling and edema.

The commissures of the mouth are frequently involved as are the skin and contiguous tissues, a characteristic pox lesion developing in the skin. Other complications are frequently found spreading from the oral cavity, i. e., to the pharynx, esophagus and crop, producing severe diarrhea and other bowel disturbances.

The Skin.—Lesions on the skin are found in quite a few cases, more commonly on the comb, wattles and other portions not covered with feathers. It is first noticed as a fine gray vesicle, which soon develops into small elevations of a reddish gray color, which later becomes more grayish yellow. Microscopically the nodules are composed of degenerated epithelial cells. These nodules in some cases become quite large, warty in appearance, dry and hard. In severe cases large numbers of these nodules are found distributed over the skin on exposed surfaces. On removing the surface of the nodules a raw granulating area is noted. Some cases show distinct degeneration of contiguous tissues.

A mixed variety of the disease is of

frequent occurrence, the mucosa showing the characteristic deposits and the skin pox lesions. It is quite evident in these cases that the disease spreads from one location to the other, and the difference in the lesions is due to the difference in the structure of the tissue involved.

General Symptoms.—In the early stages before much secondary infection takes place, there are no marked symptoms such as appear later. The birds show dullness, assume a sitting posture, wings are held pendant, plumage becomes rough and the patients show much depression. The comb and wattles grow bluish red in color, later pale and cold. In the colder climates the disease often assumes a sub-acute or chronic form, while in warmer climates the acute form is more often observed. Frequently, however, the disease assumes the character of a chronic catarrh.

Treatment.

There have been many drugs recommended in the treatment of this disease, and so far none of them have proven satisfactory. Daily treatment of individual birds is a tedious and laborious task, especially where large flocks are affected.

The lesions, whether on the skin or in the mouth, should be washed with antiseptics, boric acid solution, 2 percent, potassium permanganate one-fourth of 1 percent, or any other equally efficient antiseptic. The deposits should be removed with a curette or dull knife before applying the antiseptic.

All newly acquired birds should be examined and isolated for at least ten days before allowing them to come in contact with the regular flock. As soon as the disease is recognized, it is recommended that all birds be vacci-

nated by a local veterinarian immediately to check it. Healthy flocks and those intended for exhibition purposes may be vaccinated to establish an immunity, which will last for at least one year.

Fowl Cholera.

Cholera Gallinarum. Fowl Typhoid.

This is an acute contagious disease of fowls, usually occurring in an epizootic form, and affecting particularly chickens, geese, pigeons, ducks, quail, sparrows, and pheasants. It is characterized by a general infection, and the prominent symptom of diarrhea.

Fowl cholera is found in most sections of the United States, causing extensive losses to poultrymen. The finer breeds of fowls seem to be more susceptible to infection, probably because of exposure to the disease at poultry shows and other public exhibitions. It occurs as an epizootic sometimes destroying entire flocks making the losses serious from an economic standpoint. The mortuary loss, the loss in egg production, and the interference with breeding operations make fowl cholera a formidable disease. The disease often spreads over a large area producing enormous losses.

Natural infection may take place in numerous ways: (a) The droppings of fowls contaminate the feed and water given other fowls and the infection is thus introduced immediately into the digestive tract.

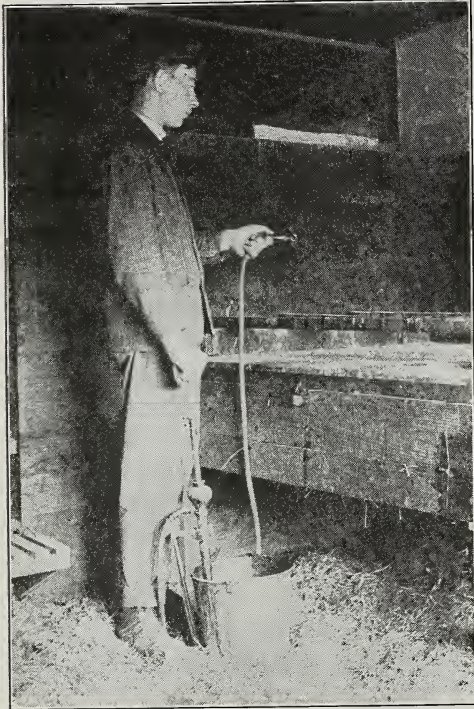
(b) In most cases the flock is infected thru newly acquired cholera-sick birds, or birds returned from shows or exhibitions where they have been in contact with the infection.

(c) Pigeons and sparrows play an important part in the dissemination of cholera, by carrying the infection from flock to flock. This accounts for iso-

lated outbreaks of the disease where no exchange of birds has taken place.

(d) The infection is frequently carried on clothing, shoes, and other objects.

(e) It may be spread by carelessness in properly disinfecting cars in



Spraying Disinfectant

which cases have been transported. This has proven to be the source of infection in a number of instances.

(f) Eggs have been the carriers of the infection in some few cases reported.

The period of incubation varies somewhat, no doubt due to the mode and virulency of the infection. It is usually 1 to 4 days; occasionally 4 to 7 days. Fowl cholera is characterized by its sudden onset and the rapidity of its course. When it first appears in a flock, birds will drop dead without showing any

symptoms. They may be found dead beneath the roost, or on the nest. Some of them when attempting to walk or fly will drop suddenly and die after a brief struggle. After the disease has been in a flock for a few days, the less susceptible will show some marked symptoms. The birds lose their appetite, become weak and greatly depressed. The wings are usually pendant, the neck curved, and the head pulled downward. The entire plumage becomes ruffled, and the birds walk with a weak, staggering gait. The temperature is 2 to 4 degrees Fahrenheit above normal. Diarrhea, accompanied by intense thirst, becomes a prominent symptom. The droppings are at first of a yellowish gray color, later becoming very thin, watery, fetid, of a greenish cast, or dark green. The feathers around the cloaca become oiled and matted with the bowel discharge. Marked dyspnea begins, the bird opening and closing its mouth during respirations; wheezing and rhonchi are frequently heard and the comb and wattles are dark blue. The bird finally becomes weak, staggers about, falls down, and dies in convulsions.

In the chronic form of the disease, the course is much longer; the bird grows anemic, emaciated and cathartic. Frequently the joints are enlarged; the joint capsule may rupture and discharge a sero-purulent material. Death results from exhaustion after a period of several weeks.

The mortality is 80 to 95 percent. Frequently the entire flock will die. In some outbreaks the disease runs a milder course, the virulency of the infection not being high.

Treatment consists in the administration of bowel antiseptics and disinfectants. The course of the disease is usually too rapid for any medical treat-

ment to be of value. It is advisable to administer to the entire flock a solution of iron sulphate (1 percent), which they should be allowed to drink freely, or a solution of tannic acid ($\frac{1}{2}$ to 2 percent), which may be administered with a medicine dropper (20 to 30 drops) to each bird twice daily. Some have claimed excellent results with sulphocarbolates (3 to 8 grains) once daily. Various other medicines have been recommended but none have proven to be specific.

Serum has been made which produces a passive immunity lasting for a period of one or two weeks. This is recommended as a preventative when the disease makes its appearance in a flock, or when a flock of birds is exposed to infection. Vaccines have been used but the results have been unsatisfactory where the birds were already infected. On the other hand, good results have been reported from the use of vaccines to prevent the disease in the healthy birds of an infected flock. Vaccines seem to establish immunity in healthy flocks, preventing the disease or reducing the mortality.

Preventative treatment is by far the most important. In applying it, the following should be considered:

(1) All newly acquired birds should be isolated for at least 10 days before being allowed to come in contact with the regular flock.

(2) When the disease makes its appearance in the neighborhood, precaution should be taken in regard to the carriers of the infection. Administer antiseptics mentioned above.

(3) When the disease appears in the flock, radical measures must be taken promptly. All healthy birds must be removed to new, uninfected quarters. The sick birds should be destroyed at once, and either burned, or buried in lime. All litter and droppings should be treated in a similar manner. Disinfect the houses, coops, ground and yards with liquor cresolis compositus, using one gallon to thirty gallons of water. Use a spray pump so that the disinfectant will be forced to the ceiling, walls, and all parts of the building. The buildings and coops should then be allowed to stand open for a few days to allow the air to come in contact with all parts of them. It would be advisable to start with a new flock in the new quarters after a few weeks. A second disinfection would be recommended before allowing birds to be placed in the buildings.



BEES IN RELATION TO HORTICULTURE

Their Connection with Diseases, Injuries, and Pollination

CHRIST R. GAISER, Cleveland, Ohio

THE fact that bees visit flowers for the purpose of securing the nectar found within them, and the pollen which they use as a food for their brood, is of no great importance to the horticulturist unless he is rearing bees for the production of honey. Bees, however, perform another act which although it is of no direct value to themselves is of the utmost importance to the horticulturist; it is that of the pollination and cross-pollination of blossoms.

To anyone concerned in the production of fruit, the importance of this will at once become apparent, inasmuch as a large number of our common varieties of fruits are self-sterile or only partly fertile. "Oregon Agricultural College Experiment Station," Bulletin 104, states that in a test of 87 varieties of apples, 59 varieties were found to be self-sterile, that is unable to fruit when self pollinated; 15 varieties were found to be self fertile and able to produce fruit when relying on their own pollen, but when crossed with other varieties better results were obtained. Thirteen varieties were classified as partly self-sterile. This experiment has shown that a large majority of our apples depend upon cross-pollination. The factor of sterility is not confined to the apple but occurs to a greater or less extent in all of our cultivated fruits, grapes, plums and cherries, consequently it is of the greatest importance that the horticulturalist make use of all the various agencies by which pollen is carried. The fact that bees carry considerable pollen is well known, and coupled with their habit of visiting a number of blossoms during each trip,

make them one of the most potent factors in cross-pollination.

J. W. McColloch of the Kansas State Agricultural College, records one instance where a bee carrying pollen on its legs was observed to visit 61 blossoms before it was lost sight of in the top of a tree. The bees were also observed to prefer the trees with the most bloom, and as quickly as the petals began to fall the bees ceased visiting the trees.

Experiment stations all over the country have shown that it is generally quite useless, unnecessary, and highly dangerous to the crop, to spray the trees while in bloom, and that the proper time to spray (for the codling moth) is when most of the petals begin to fall. By this time the majority of bees will cease working on the blossoms, as they limit most of their activity to the flowers while in full bloom.

Relation to Seed Production.

In nurseries and on farms, where the production of seeds and grains are a commercial proposition, the amount of good seed produced per acre is of prime importance. Different varieties produce different yields, but these yields are all directly dependent on the extent of pollination. On self fertile varieties this is not of so much importance as in those that require cross pollination or have some physical impediment which prevents self pollination.

Bees and Fruit Injury.

Bees have often been accused of injuring fruits by sucking them dry of their juices. The fact is, that the mouth parts of a bee cannot puncture the skin of even our very thin skinned fruits;

however after the skin has once been broken, either by mechanical injury, stinging or feeding puncture of some other insect or birds, the bees will use whatever juices they can extract from such fruit and convert them into honey, thus preventing their total loss. Birds are one of the biggest factors in the injuring of fruit. Among the most destructive of these are the Baltimore oriole, Cape May warbler, and the ever present sparrow, as well as a few others. The Cape May warbler is especially injurious in grape vineyards.

Bees and Infectious Diseases.

It has long been acknowledged that bees are carrying agents of the dreaded fire blight, twig blight, most often called "pear blight." However, if one studies the characteristics of the disease he will find that the bees are not the primary source of its spread.

The disease is due to a bacterial organism (*Bacillus amylovorus*). In the early spring, about the time the blossoms open, a thick sticky exudate issues from various previously infected portions of the trees, generally on the trunk and limbs, in the immediate vicinity of cankered areas produced by the disease. This exudate is filled with countless numbers of these organisms, and as it is somewhat sweet in nature, is greedily visited by a large number of insects, most important among which are the various flies, ants and bark bee-

tles. These in turn carry the adhering bacteria to the blossoms where the organism continues to multiply in the nectar; to the burrows, and sometimes also the roots. It is then an easy matter to conceive of bees visiting some infected flower in the course of its natural pursuits, and in this manner becoming an agent of distribution of the bacteria which may become attached to it, and so the disease is readily spread over a wide area and numerous blossom infections and twig infections are produced as the disease travels down the twigs from the infected blossoms.

However, the spread of this disease is not confined to the blossoming period or early spring months, as it has been shown that leaf-hoppers, tarnished plant-bugs, and aphids transmit this disease during practically the whole growing season thru leaf and twig punctures. Certain experimenters also attribute root and trunk infections to ground and click beetles.

From this it is easy to see that bees are only one of the many sources of distribution of pear blight, and only a secondary agent insofar as they have never been observed to visit the primary exudate and cankered areas. Although the fruit tree bark beetles and other beetles have been incriminated as carriers of the blight and have been seen on the exudate, it is somewhat doubtful if they visited these areas for the purpose of food.



MANAGING A COMMERCIAL ORCHARD

Factors To Be Considered in the Fruit Industry

H. A. ALBYN, Toboso, Ohio

ANY line of business that is highly successful today is being managed by a specialist. So the manager of commercial orchards must be a specialist, one who is familiar with planting, cultivating, pruning, spraying, packing and marketing, but most important of all he should be able to manage labor. One must be patient and able to concentrate every energy upon the orchard

tain but one class of fruit and that would be the class best fitted to the local conditions, or if I were more familiar with some other class, I would move to the locality in which it would grow best. That class would then be limited to a few varieties. For example, if I were to set out apples, I would not set more than five varieties, and 80 percent of the orchard would be composed of



Where the Man Is an Important Part of the Business

if he is to be a successful manager. I believe that a farmer seldom makes a good orchardist, and therefore do not think that any kind of farming should be mixed with a commercial orchard.

The work on the commercial orchard should be specialized as one cannot compete with the whole country in every class of fruit. If the writer were to set out another orchard it would con-

not more than two varieties. This number is about all one will find in a successful commercial locality.

The apple orchard is the most profitable and the most easily handled under present labor conditions. One acre of apples will pay about five times the net profit of either plums or cherries and in about the same proportion with other fruits.

While poor ground can be used to advantage, the best ground is none too good for a commercial orchard. Rolling ground is best adapted to fruit, but steep hillsides make the operation of machinery difficult, and sometimes much more expensive.

The best labor saving devices must be used for economy. This is especially true of the sprayer. It should be a high pressure type capable of maintaining a pressure of 200 pounds per square inch. When the spraying is being done there should be an extra supply tank wagon which will keep the work continuous as there is usually a short period in which to do the best work. Light packing houses should be convenient to the orchard when the crop is moved. Good roads and trucks will improve the efficiency of the laborers in marketing the crop.

The writer has tried to grow various kinds of crops between the rows of trees but would have been far ahead if he had never taken any kind of crop off of the tree ground, as all fertility which was taken off had to be bought and replaced in the form of commercial fertilizers. On land that will permit, best results can be obtained from clean cultivation for the first four years. This is accomplished by clean culture up until August and then sowing a cover crop to be plowed under in the following spring. The sod mulch system should be used after that, keeping the space three or four feet from the trunk of the tree clean at all times.

We have each tree numbered with a tag showing the street or row, also bearing a symbol showing the variety. Each orchard is called a division and we have a blue print of each division showing each tree. The manager carries a notebook and notes any attention that a tree may need. When this is handed to any workman he can go direct to the tree without any trouble because he has the number and row letter.

We are doing everything that we can in the winter and on rainy days we try to get everything done that is possible to do under cover. Repairing, oiling and adjusting of machinery can be done at this time. We also order supplies and duplicate parts that might stop our work during the rush season.

A good orchard manager must be a hustler and a leader, familiar with every branch of the business so that he can perform any part of the work efficiently. Produce a high class product and sell to firms that are perfectly responsible. Too few realize the expense of growing number 2 and cull fruits. Thinning will pay in every case where there is a full set of fruit as this not only saves future grading but plant food which would go into a cheap or worthless product. Too much care can not be used in grading and packing, for the package should be full measure and contain just what it is labeled. I know of no better way to improve your judgment and your product than by competing at the fruit shows and fairs.

BATTLES OF THE POULTRY WARRIORS

To Win the War; Feed the Nation, and Profit the Producer

CLARENCE OUSLEY, United States Department of Agriculture, Washington, D. C.

THE humble hen can play a prominent part in preventing the progress of the Prussian peril. The quickest and cheapest way of adding to our meat supplies is to increase poultry and egg production. To double this production next year will give us 6,500,000,000 pounds of meat food in the form of poultry and eggs. By having this amount of poultry food for domestic consumption we will eat less pork and beef and can send almost that many pounds of meat to Europe to feed our soldiers, the armies of the Allies, and the destitute civilians.

We can not increase any of the meat animals as rapidly or economically as poultry. The United States Department of Agriculture wishes every farmer to understand the importance of doubling our poultry production next year. It is a vital part of the general food production campaign, and that campaign must be carried out in all its details to insure victory in this war. The chief poultry increase must be made on the general farms and on **every** farm in the country. It must be made as a by-product of general farming. The farmer should get his flock to such size, in proportion to his farm, that all the waste and scraps, and land available for chickens to run on will be used, and the fowls kept up from these sources and a reasonable amount of other feed. The department does not suggest that extensive poultry enterprises be taken up by the general farmer. In fact it warns against that, but it urges **every** farmer to keep just as many hens, and produce just as many chickens and eggs as he can economically, as a by-product of his general farming.

The average size of the farm flock in the United States now is 40 hens. If the average is increased to 100 hens next year the desired increase in production should be obtained. Many farms, of course, can have flocks of several hundred, and some farms will have to keep less, but the effort is to increase the farm average to at least 100 hens.

It is an astounding fact that there are a million and a half eggless farms in the United States—an economic anomaly and an agricultural absurdity. Out of a total of 6,371,502 farms, 1,527,743 report no egg production in the last census.

Even if we had never been forced to go to war with Germany this condition would be one demanding every effort at correction—for each farm can, at least, produce sufficient poultry and eggs for home consumption, and thereby be more profitable. It would be to the self-interest of every one of these million and a half farmers to commence poultry production, if there were no war. But because we are at war there is a more important reason why they should do so—the fact that they will be helping win the war—helping to preserve their own free existence in a free country.

Chickens Self Feeders.

Chickens will “pick up” a good part of their living from waste that otherwise would never become of any value. They will feed themselves, to an extent, from grass, weeds, insects, and crumbs and small scraps that, if not eaten by chickens, would not become of food value to man. They will eat the eggs and larvae from which come various destructive insects, particularly orchard

pests. In some orchards where chickens range the brown tail moth has almost disappeared, while nearby orchards, where chickens do not run, are damaged by the pest.

Most of the attention required by farm flocks can be given by the women and children of the household. The question of labor is not a puzzling and uncertain problem in the poultry production program. If the farmer increases his flock to a size suitable to fit in as a by-product of his general farming he will find that it will not require extra help.

Because of these facts—that poultry, as a by-product of general farming, find much of their feed in waste and require no extra labor—the farmer will produce meat food at the lowest cost. Home consumption of this will cut down his living expenses and enable him to sell more of the animal meat he produces. He will be making more money himself, and at the same time he will be helping Uncle Sam win the biggest war the world has ever known.

Prepare for Early Hatch.

Early hatching next spring is necessary if the desired increase in production is attained. It is also necessary, during the winter, that farmers save young hens and pullets, so they will be on hand for stock in the spring. The stock of the nation has been reduced considerably this fall by a widespread sale of young hens and pullets. Therefore it is necessary to conserve stock now or the shortage may interfere seriously with the production program. In view of the stock shortage, to kill a good hen now is to reduce the potential egg production next year anywhere from 5 to 12 dozen eggs.

Early hatching in the spring will increase the number and size of fowls and the number of eggs produced next year.

It will result in bigger birds, and birds that will lay in the winter months.

The hatching season varies in different parts of the country, running thru February, March, April and May, generally speaking, although in some parts of the southwest hatching may start in January. In the middle west, where ten states in the grain belt produced half the poultry of the entire nation as shown by the last census, the hatching season has been during the late winter and early spring months. Every farmer is urged to start the hatching season earlier than usual next year, either by incubation or natural methods if the hens will sit earlier.

The chickens first hatched in the spring are the ones that are largest in the summer, mature first in the fall, and lay eggs in the winter. Furthermore they are the ones that will want to sit early the following spring which, in turn, will hatch earlier chickens—and so the cycle will continue. On the contrary, chickens hatched late in the spring do not mature until so late in the fall that they will not become winter layers. They will not sit until late the next spring, and so another cycle of late maturing, late laying fowls is established.

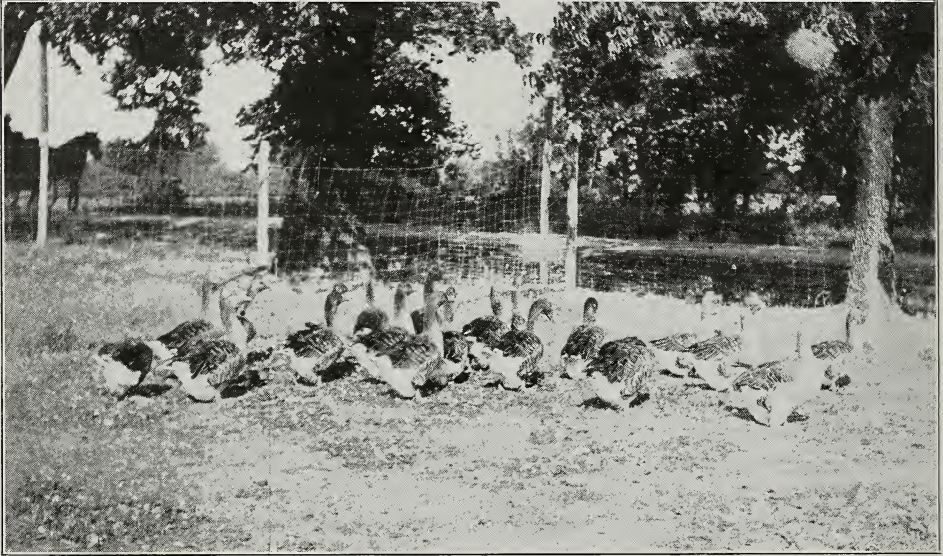
About seven months are required for a chicken to grow to maturity. During that period of growth its feed goes to the making of bone, flesh, feathers. When it becomes mature its feed goes to the making of eggs and the hen commences to lay. If a bird matures and commences laying in the fall before cold weather she will continue laying all winter if properly treated. Birds that are still growing when cold weather comes, and do not mature until during the winter season, will rarely commence laying until late the next spring.

The early hatched chicken has a

longer growing season before cold weather. It has more time in which to develop—simply gets an earlier start—and grows larger. One of the principal reasons that the farm flocks of the United States show a low average weight of fowls is that the cycle of late hatching has become established. That custom can be displaced and early

early hatched birds are more apt to live thru the summer.

So the farmer who hatches early gets more chickens, because a larger proportion of the total hatch will live; more actual meat, because they will weigh more at maturity than late hatched birds, and more eggs because the early hatched pullets will lay eggs during the



Cheap Feed Insures Reasonable Profits

hatching established by killing off the late hatched birds and retaining only the earliest hatched birds for stock. Once the cycle of early hatching is effected it will perpetuate itself. The impulse of the early hatched chicken to sit early herself and produce more early hatched chickens having the same impulse will continue on and on.

Chickens are hurt most by lice in the midsummer months. The late hatched chicken has not had time to become large or strong enough to resist such attacks, but the early hatched chicken has, by midsummer, grown sufficiently strong and hardy to resist the attacks of the lice. Because its early development has preceded the hot weather, the

winter and the late hatched ones will not.

What Poultry Will Do.

Summing up the situation, these are the things for the farmer to do in order to increase poultry production:

Stop marketing for meat this winter the young hens and pullets that have potential egg production value next year. Save stock now to insure an adequate supply of layers for next spring. Start the hatching season earlier next spring, produce infertile eggs after hatching season, dispose of eggs not needed for home use twice a week and preserve eggs for winter use at home from the surplus of the heavy laying season.

The advantages to the farmer in doing these things will be: First, that he is performing a patriotic service and helping win the war. He will also reduce his cost of living, have more stuff to sell and make more money.

The poultry increase must come from the general farms, and every farmer should do his part. He will be turning wastage into food, to his own profit, and he will be helping his country. He will be improving his land while he is fighting the Kaiser. Ninety pounds of manure per year is produced from an ordinary fowl. Not half of it is collected, usually, but even upon that basis, 50 fowls will give at least a ton of manure that properly used is as valuable as commercial fertilizer.

The farmer need not fear overproduction of poultry and eggs. With the maximum production urged by the Department of Agriculture there will still be a gap of many millions of people, between the total number of producers and consumers. The increased production will have the effect of popularizing poultry food—making it available to many people who have not been able to afford it. And yet, production cost having been so low, the producer will have a good profit.

The greatest poultry increase will be in chickens, but some ducks and geese should be raised on most farms. The goose grows faster than any other fowl, and both geese and ducks are fat producers, and will yield pork-fat substitutes for home use. Turkeys, the most difficult fowls to raise, should be handled extensively only by those who are familiar with the bird and have large range for them.

Save the Hens.

Thrifty young hens and pullets should not be marketed at this time or during

the winter months. They should be kept for stock next year, when there must be a large increase in poultry and egg supplies as an essential part of the food production campaign which must be carried out if we are to win the war.

Already this year the poultry stock of the country has been dangerously reduced by sales of pullets and young hens during the late summer and fall. Each of these fowls represented a potential egg production of from 5 to 12 dozen eggs next year and each young hen marketed for food this winter may mean a reduction of next year's possible egg supply to that extent. The United States Department of Agriculture urges farmers, dealers, shippers, and all who are interested in poultry affairs, to save fowls of producing qualities so they may be on hand for stock in the early spring.

Next year it will be necessary for poultry to be produced on every farm in the United States, and in every backyard in town where conditions permit. Farmers who have not been producing poultry must do so next year, and those who have been producing must increase the number of fowls in their flocks. By this general increase, and the putting away of eggs for winter use, there will be millions of pounds of beef and pork released for use in Europe. No meat supply can be increased as rapidly and economically as poultry, and its increase, so far as food reserves for the war are concerned, will be almost as valuable as tho a proportionate quantity of animal meat stuffs had been quickly obtained. It is possible to double poultry production in one year. That year should be 1918. It will help win the war. Raise poultry and do your part.

THE FOOD SITUATION IN FRANCE

Effect of the War Upon the Meat Supply and Other Provisions

FRED B. PITNEY, War Correspondent, Washington, D. C.

THE French government is quite bureaucratic, but the French people do not like to be overgoverned. They object seriously to anything that savors to them of meddling in a man's private affairs. For this reason it has been extremely difficult to get a workable income tax law in France. The people immediately rise against the proposal to give the government the right to examine their books and find out if they told the truth about their incomes, or find out what their incomes were, if they failed to make a return. So a scheme has been figured out for taxing a man on seven times his rent, if he made no income tax return, or one the government thot too low.

Saying how much or what a man shall eat is also getting pretty close to private affairs, and therefore the French government, knowing intimately the people it has to deal with, is slow in coming to such measures, even in face of the only too evident food shortage in the country. There have been efforts at price fixing, but they have not worked satisfactorily, one reason being that they have not been national, but local. Paris, for example, has tried fixing the price of butter but it has been found that the result has been to drive butter away from Paris to localities where it could be sold for what the market would pay.

National Price Fixing.

A scheme of national price fixing is to be tried now with beans and potatoes. Both of these crops are far below the requirements of the country. I have seen many days when potatoes could not be bought in Paris, and it was a common thing last winter to have to

run over half of the city to find a market where green vegetables could be bought. The national price fixing scheme for beans and potatoes will divide the country into districts and fix the price for each district, with a penalty for sending either commodity out of the district without permission.

So far meat has withstood all efforts to control its consumption—there has been no attempt to control its price—and yet it is vitally necessary either to control the consumption of meat in France or to increase the supply. Otherwise, the end of the war will see the country so reduced in its herds that it will take many years to bring them back again to the point where France will be once more self-sustaining.

Supply Must Be Increased.

Of course, the thing to do is to increase the supply. When a country has had its breadstuffs cut down to the extent to which France has suffered, the people naturally fall back on meat. One might think they would fall back on vegetables, but the same reasons that have deprived them of grains have deprived them of vegetables. There have not been the hands to cultivate the ground. They could not raise more vegetables than wheat. And they have fallen back on beef, mutton and pork. The herds existed and they have been eaten up, as the people had to have something to eat.

To what extent the herds have disappeared is shown by the cutting down of the meat ration of the soldiers at the front. At the beginning of the war they were allowed one pound of meat a day. Twenty percent has now been cut from that allowance.

Meat Shortage Serious.

Civilians, naturally, were the first to suffer, when meat became scarce. The price went soaring. Retail prices to consumers doubled and trebled. The poor cut down in quantity, one understands, and the very poor went without entirely. But those who could pay could have meat, if they were willing to give the price.

The time came, however, when there had to be an attempt to control the consumption. The army requires 36,000 tons of meat a month, or 432,000 tons a year. France's herds suffered enormously at the beginning of the war. A total of approximately 2,500,000 cattle, sheep and hogs from the French herds were seized by Germany in the invaded provinces. Coming immediately on top of this loss France found herself compelled to find food for some millions of Belgian and French refugees. This had to be done at once and the herds remaining had to be slaughtered without stopping to ask questions about the future. One does not say to a starving man, "What will I do tomorrow, if I give you this crust of bread to-day?"

England, therefore, undertook to supply France with 250,000 tons of meat a year, and this supply was kept up at the rate of about 20,000 tons a month until February of this year. At that time the English supply stopped. England was then having all she could do to feed her own people on reduced rations.

Thus, since February, France has had to supply from her own resources 432,000 tons of meat a year to her armies; 1,428,000 tons for the civilian population, and another 350,000 tons for refugees, making a total of 2,000,000 tons of meat a year demanded by France.

Herds Depleted.

What are the herds she has with which to do this? At the beginning of 1914 her cattle herds comprised 14,787,710 head; sheep 16,131,390; and hogs 7,035,850. By the end of 1914, after five months of war, her cattle were reduced to 12,000,000, her sheep to 14,000,000, and hogs to 6,000,000. To-day her cattle herds are cut down more than 20 percent, while her sheep number no more than 10,000,000 head, and her hogs 4,000,000—a loss of nearly 50 percent of her hogs and three-eighths of her sheep on top of the loss of 20 percent of her cattle.

Crying Need for Meat.

The government is trying to conserve the meat supply and save the herds now, by limiting the use of meat to one meal a day. The endeavor is made to accomplish this purpose by forbidding the sale of meat after 1 o'clock in the afternoon, and ordering the butcher shops closed at that hour, while hotels and restaurants can serve meat only with the noonday meal. But this measure has had little effect on the use of meat as it serves only against the restaurants. Housekeepers can buy all the meat they want before 1 o'clock, and they do it, as there is no restriction in the amount that can be bought. Moreover, in the restaurants one can eat all the meat wanted at midday, and thus make up for having none at night, and this is the practice.

There is only one real solution of the problem. France must have more meat. Her herds are disappearing rapidly. They are to-day far below the danger point. Soon they will have to be reconstituted entirely, and all the while meat will be a pressing need for France.

BABY CHICKS AND COLONY BROODERS

How the Farmer Can Increase His Supply of Meat At Low Cost

HERBERT H. KNAPP, Tiro, Ohio

THE demands of the Federal Food Administration fall heavily upon the farmer, his patriotism and loyalty being appealed to as never before; he responded nobly in 1917 and increased the crop production despite the weather conditions of a subnormal season.

Now comes a still further demand for another increase. It would seem that the farmer had gone his limit the last season, but vastly more is being expected of him in 1918. We are absolutely sure that food will be a large factor and it may be the determining factor in terminating the colossal struggle.

The farmer is ready but he must work under a handicap. Much of his help has joined the colors; instead of producing this next season these men must be fed by the farms they helped to till last year. What is the solution? Hundreds and thousands of brave wives and mothers will help till the fields; they will ride the sulky plow, the harrow, the roller, the cultivator and the binder. Here is where one of the chief industries of the farm is apt to suffer if the campaign is not carefully planned, with a resultant loss of a food product that is demanded in largely increased quantities.

Mr. Hoover has asked that poultry and eggs be used to a large extent to save beef, pork, and mutton for the use of the allied armies. The farmer's wife has been a large producer of poultry. If old methods are pursued time will not permit her to give the poultry the required attention as she cannot attend to numerous broody hens each with a few chicks. They require the best of care and attention to make them profitable. Neglect is a breeder of trouble

in a poultry yard. Genius, however, has solved this problem. Baby chicks by the millions are shipped each season by men who make a specialty of this branch of the poultry business. Good, strong, standard bred chicks of any of the leading varieties of Leghorns, Plymouth Rocks, Rhode Island Reds, Wyandottes, Minorcas or Orpingtons may be purchased in almost any number at prices that average fifteen to twenty dollars per hundred. By this method the busy farm woman may order her chicks in January or February with only a small deposit in cash with delivery assured at any time desired.

The problem that naturally arises is how to take care of large numbers of chicks without mothers. Genius again comes to the aid of the perplexed poultry keeper and supplies the coal burning brooder that, next to the shipping of chicks, is the greatest boon that ever came into the poultry industry. These wonderful brooders require but little attention as they are automatic in their regulation and need attention but twice daily, when the fuel supply is renewed. The writer has experimented with these brooders since the time they were first put on the market and does not hesitate to say they are the greatest help to poultrymen of all classes that has ever been offered in all the annals of poultry industry.

The farmer that will equip the poultry yard with a suitable building which is 24 x 12 feet in dimensions and install a brooder of 500 capacity has supplied all the apparatus necessary for a proper start of the season's supply of poultry. The good wife or other member of the family who operates the poultry plant

can obtain four or five hundred chicks and start them at the same time. The care necessary to operate the brooder will consume no more time than would the care of one old hen with a dozen chicks, a half of which would be lost on account of lice and trailing thru wet grass. The advantages of starting all the chicks at one time are numerous, as they are of the same age, are fed alike, and are of uniform size. Also the cockerels may be removed at the same time and bring a better price upon the

the ground is spaded the second time it should be sown liberally with lime to sweeten and purify it.

After six or eight weeks, depending on the weather conditions and the breed handled, the chicks should be placed in colony brooders, 4 x 6 feet, 50 chicks to a house. When the cockerels are removed this gives ample room for the pullets until they go into the winter laying house. Corn should be planted close to the colony houses which will afford plenty of shade, protection from



Interior of Mr. Knapp's Hatchery at Tiro, Ohio

market, giving the growing pullets all the advantages possible. This results in their beginning the laying period at an early date and a better supply of eggs at high prices.

Chicks started in this way should be confined to wire runs the first few weeks, or as long as they are kept with the brooder. It is best to have two runs, one to be spaded and sown to oats while the chicks have access to the other, which should have a good crop of oats three or four inches high when the chicks are first turned in. Before

hawks, and a liberal supply of bugs and worms as the corn is worked.

These suggestions are offered in the interests of more poultry in this time of need, and the writer sincerely trusts that these new methods will be adopted by farmers generally. Every pound of poultry meat means just one more pound of meat for our soldier boys and our allies. It means not only a more speedy victory over our enemy, but it will make the farm poultry work less of a drudgery and more profitable.



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STAFF

V. G. APPLGATE, '18, Editor-in-Chief.

M. V. BAILEY, '18, Business Manager.

PRUDENCE STEVENS, '18, Home Economics Editor.

W. L. HAMMOND, '18, Circulation Manager.

Assistants to the Editor:

G. F. Henning, '19

C. R. Arnold, '19

S. G. Price, '19

Assistants to the Business Manager:

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L. C. Prickett, '20.

COLUMBUS, OHIO, JANUARY, 1918.

EDITORIAL

IDEAS OF PROFITS.

The money question has so long held the attention of the American people that when the time comes to decide between patriotism and profits, duty and pleasures, sacrifice and privileges, it is difficult to stop and do that which liberty and democracy demand.

When the farmer is asked to increase his wheat crop 25 percent or to raise 20 percent more hogs, he begins to ask himself the question, "Will there be any money in it?" Wheatless and meatless days are too frequently looked upon as a trespass upon privilege and not a duty. Sugar is wasted at every meal in private homes while thousands of "our boys" in uniform have none to use. Everything has been so easily obtained that the habit of thinking that this must

always be so has been formed and the impression upon our customs and traditions is hard to efface.

But what of the "boys" in France and Italy. Do you believe that the question of profit, the idea of pleasure, or the joys of privilege dominate their minds as they offer themselves and all that is theirs in the intense struggle for liberty and peace? Their ideals are no longer those of pleasure and profit but rather the giving of all that life means to them for the cause of humanity. No longer does the American dollar appeal to them but their energies are increased and their activities are sustained by the sight of the stars and stripes that fly above them. Can not the people who remain at home cease to remember the American dollar and help to give the world American peace and honor?

STOP THE LEAKS.

Leaky roofs are always to be condemned, but there are many other places on the farm that show the results of leaky management. We went out with a man to see him feed his hogs and were surprised to see him throw at least five bushels of corn out in the mud for them to get as best they could. By the aid of pencil and paper he was shown that he could build a concrete feeding floor with the corn that was lost in the mud each year, not even considering the sanitary conditions.

And then he began to feed the cattle. The hay and corn were scattered around on the manure in the barnyard where they were wasted by the continual tramping of the cattle and hogs. Again he was shown how the extra corn and hay would soon pay for a feeding rack that could be cheaply constructed of some waste lumber. Besides it is a patriotic duty to save and use all the feed possible.

Then he began cleaning the stables, throwing the manure just outside the door where it was exposed to the rains. He was shown how this manure would have greater value if hauled directly to the field. Only a few of the leaks but look out for many others.

ORDER SUPPLIES NOW.

In this time of increasing demands upon everyone it becomes necessary for each to do that which will be of greatest service to his flag and country. The farmer is bearing a grave responsibility and he must be able to raise the crops which will be demanded or the world will go hungry. Everything that is worth while requires preparation so the task before us today is to increase our service for preparing for next year's crops.

The immediate ordering of fertilizers,

spraying machinery, repairs and other necessary articles is one of the methods of preparation within the reach of all. The factories are working overtime to supply the demands that are made upon them and if these supplies are to be received on time, it is essential that the orders be placed early.

Not only are the factories overburdened but the freight congestion has become a serious trouble. Railroads are transporting thousands of car loads of guns, munitions, armor and clothing that were not considered in their plans before the war. It is not expected that they can keep up this enormous traffic and also move their ordinary amount of material on schedule time. If the people expect to secure their supplies on time, they should be ordered now to avoid the delay that will necessarily follow if they are ordered later. The materials can be held until the crops are ready easier than you and the crops can wait for them to arrive.

SEED CORN CARE.

Year after year the farmers harvest soft corn, altho it is true that there are some years when such corn is scarce. The summer weather and the early frosts usually get the blame even if the seed corn has been picked from the shocks or standing stalks as late as December.

The early frosts of last fall have proven again the wisdom of those men who have been selecting their seed corn early in the fall so as to get those ears which have matured first. Altho experiment stations and agricultural colleges have advocated this practice for many years, few have heeded the teaching, but it will require only one or two bad corn crops to call attention to the fact that early selection of seed corn is

the best way of insuring a sound crop.

When the seed is thus chosen the ears which have matured early are always selected and after a few years the growing season of the corn will be shortened noticeably. As the seed is now chosen there is usually a tendency for the crop to require more time for its development from year to year. If the seed corn is stored in a dry place, free from rats and mice, there should be no great difficulty in securing a stand that would be a credit to any farmer.

PROVIDE SUITABLE WATER.

Numerous kinds of watering troughs for farm animals have been invented in recent years. These have two objects: one is to keep the water clean and the other is to have it where the stock can get it at all times. Either of these advantages, if attained, would be a sufficient reason for possessing such a tank.

The automatic fountain should be so constructed as to keep the stock from getting into the water and making it unclean. The last object is possibly greater than the first as the old way of watering the stock and poultry two or three times per day is poor management. It is just as important to the stock that they have plenty of water to drink as it is for the man who owns them. In winter the watering troughs are usually frozen over and the ice is broken as the horses or other stock are given their daily opportunity. No wonder that the farm animals fail to fatten properly when a considerable portion of the heat derived from food is wasted by the chill that results from the drinking of cold water.

Many of the automatic fountains are

provided with heaters which have proven satisfactory. The stockman and farmer can make a good investment by purchasing a heater to keep the water in suitable condition for his farm animals. The heaters and fountains are much cheaper than feeds at present prices.

EXERCISE FOR CHICKENS.

The well known fact that a certain amount of exercise is necessary to insure the proper health in man or beast is especially true in the case of poultry. Chickens which are allowed to run over as much of the farm as they desire, go much farther in a day than we imagine. They gather a certain amount of food in their searching and the exercise which they receive also aids in giving them their bright and healthy appearance. Then along in the winter when the weather becomes bad these same chickens are often shut in the small house for several days or even a week with no chance to move about, all the energy expended coming from eating the food which is thrown into the building for them. Often quite a number of the hens, even when the weather is not so bad, spend most of their time standing in the building and waiting to be fed. These are usually the boarders while the energetic ones pay the grocery bill. A shed which provides sufficient floor space, so that the feed may be thrown into 3 or 4 inches of straw or litter of some sort will make them all work for their living in winter or summer. This prevents excessive fatness and encourages a more healthy condition among the hens which is usually accompanied by a more nearly filled basket at egg gathering time.

Home Economics Department

METHODS OF REMOVING STAINS

RUTH CHRISTEN, '18

BY using some of the simple methods of removing stains, a great many garments may be saved from the box in the attic.

First the nature of the stain should be considered before its removal is attempted, since this will help to know how to begin to treat it. If an unsuitable method of removal is used it is liable "to set" the stain and make it more difficult to remove or even impossible. For example, hot water which removes fresh fruit stains will set meat juice and milk stains. Likewise soap which easily removes grease spots will set many fruit stains.

It should also be known upon what kind of a fabric the stain occurs. The nature, color, weave, finish and weight of a fabric has to be considered as to the method of treatment as much as the kind of stains.

Strong acids destroy cotton and linen fabrics and even the weaker acids attack them to some extent, which gives the fibers the yellow color. Strong alkalis dissolve silk and wool and these are injured by the use of washing soda or strongly alkaline soap.

Hot water should be avoided in the washing of wool and silk because it turns the fabric yellow, shrinks the wool, weakens the silk and injures the finish. If either are rubbed during the laundering, the wool fibers felt together and shrinkage or thickening results, while the silk fibers are so fine and delicate that rubbing breaks and separates

them.

A simple method, if done correctly, is the ordinary laundering. First soak the stained portion in cold or lukewarm water, if necessary rubbing it with a neutral soap. Then thoro rinsing in clear water after which the article may be laundered in the usual way. This method may be used for all white and fast colors of cotton and linen, also wash silks and washable woolens. If the color is removed, it can sometimes be restored by tinting.

If the stain is on a delicate fabric and ordinary laundering might be injurious, sponging may be used. This is done by folding a clean cloth in several thicknesses or using a white blotting paper and spreading the stained article on the cloth or blotting paper, then gently sponge it with a clean, soft, lintless cloth. The same material as that which was stained, is preferable for a sponge.

Chemicals should not be used unless water and soap does not remove the stain. The chemicals which are generally used are oxalic acid, ammonia water, carbon tetrachloride and javelle water. Use only a small amount of the chemical, taking care to keep it only on stained portion and removing it as quickly as possible by thoro rinsing in clear water. Carbon tetrachloride is used like gasoline or benzine and is preferred because it is not inflammable. All these different chemicals may be obtained at any drug store and should be kept in all households.

WAR BREAD

A great deal has been written about war bread even before we as a people were face to face with the grim realities of war. We continue to hear about it and no doubt are not seeing or eating as much of it as we ought.

The name, "war bread" calls up visions of hardship, hunger and starvation. Memories of the tales of hard tack or a constant diet of corn bread during our Civil War are not such as to make us enthusiastic about including such an article of food in our diet. If the bonds floated to pay the cost of the war were christened "liberty bonds," why could not the bread which will also be doing a great service in this momentous conflict, be called by some more inspiring name as "liberty bread." Not only is this bread enlisted in the cause of political and social liberty but it gives to us a wider range of foods. We are not asked to restrict our use of bread to increase the variety so that we use all of the grains. Why should we be content in our daily meals with plain white bread when the various other cereals that are more abundant are just as nutritious and every whit as palatable?

True it is that wheat flour lends itself best to the making of a light, porous loaf. The protein of the wheat is of such a nature that it becomes elastic after it absorbs water. This makes possible the expansion of the dough to more than twice its former bulk, due to the gas formed by the growth of the yeast plant, or the reaction of certain chemicals such as baking powder or soda.

However the Food Administration is not asking us to leave wheat entirely out of our diet. One slice of plain wheat bread less per day per person

means a saving of 45,000,000 bushels per year. One pound less of flour used by each person a week will release 150,000,000 bushels for our allies.

By substitution of a pound of some other cereal each week, we may do our bit at home. In making substitution of one food material for another we must try to use one similar in composition in order to be properly nourished. Rye, oats, corn, barley, buckwheat, rice or potatoes are the materials that can be used as substitutes.

This substitution may be made in several ways. We may prefer to eat an extra serving of potatoes instead of the ordinary slice of bread. We may enjoy corn bread or cornpone instead of the wheat loaf, modified by the addition of corn meal. Fried or baked corn mush may be eaten instead of the usual toast. Rye bread has been eaten by our enemies for centuries and we must admit that their efficiency has not decreased. Barley, a much neglected cereal in our country, may be utilized in much the same way as corn, and it deserves a wider use in its various forms.

The foregoing means of saving wheat may be the ones that are easier for most of us. And yet liberty bread means bread made by substituting some other material for one-fourth to one-third of the wheat flour. We may make a stiff sponge with white flour and when it is light, stiffen to a dough with corn, rye, or barley meals, or graham flour and bran. The sponge may be divided and a loaf of each made, thus providing a variety at one baking.

Our method may be reversed by making the sponge of cooked potatoes, rice or partly cooked corn meal. When this

(Continued on Page 311.)

TRUCK FARMING IN CENTRAL OHIO

L. A. SUTERMEISTER, '18

THAT success may be attained in any type of farming with proper care and management is proven by Herman Vick, who raises truck and garden crops south of Columbus on 20 acres of black limestone soil which is valued at \$500 per acre, without the buildings. His farm is located about two miles south of the city limits on the Shadestown pike. Of the 20 acres under cultivation about 14 acres are in truck, the remainder being devoted to raising feed, chiefly corn and alfalfa.

The principal crops grown are: lettuce, potatoes, celery, beets, sweet corn, onions and turnips, along with some of the other common vegetables. Most of the sales are made on the wholesale market. Mr. Vick stated that this is more profitable than maintaining a stall on the market or running a wagon. The only times of the year when sales are made directly to the consumer is during the canning season, and then only to a limited extent. Three trips per week are made to market at Columbus, five miles distant, during the market season, which lasts from nine to ten months. Few crops are stored as Mr. Vick thinks that the slight increase in price in the spring will not pay for the labor and shrinkage in storing them.

Two crops per year are grown on five or six acres. The second crop consists of celery, turnips, lettuce, spinach and beans. Peas, early potatoes and dry onions are always followed with a second crop. Often an early crop is produced instead of a large yield so that a second crop may be grown, as Mr. Vick has no definite rotation. His general rule is that crops of the same family shall not follow one another. Crops are

often planted in the winter if the ground is in the proper condition. The planting or sowing season should begin in March.

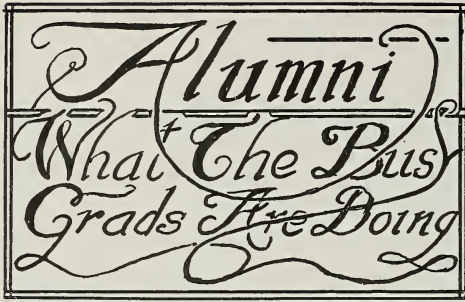
Mr. Vick has installed an overhead irrigation system for about five acres of his garden, costing around \$175 per acre for the piping and labor alone. An 8 horsepower gasoline engine furnishes the power to pump the water into a tank with a capacity of 1,350 gallons. This causes a pressure of from 25 to 30 pounds which is required for the irrigating system.

No commercial fertilizer has been used for the last two years, but manure has been hauled regularly from Columbus. This has been much cheaper, but it is now commanding a rather high price. The manure is spread on the ground in the fall and plowed under as soon as all of the crops are marketed. The ground is plowed as deep as the soil lies and then it is plowed again in the spring. A few years ago a 1-8-6 fertilizer was used, but this was too expensive. "There will be a time when commercial fertilizers must be used," said Mr. Vick.

Weeds are troublesome as the horse manure and irrigation tend to increase them rapidly. They also tend to carry a great number of plant diseases and make a breeding place for plant insects.

He has a helper hired by the year and another for eight or nine months, but four or five additional men are required during the rush season. Three horses and a few chickens are kept on the farm, but only one-half of the feed is raised. He stated that he had thought of buying a truck, but had come to the conclusion that his present method was better.

(Continued on Page 311.)



Milton K. Sharp, '16, a member of Battery A, 134th Field Artillery, located at Camp Sheridan, Montgomery, Alabama, was instantly killed when a team of horses which he was leading became unmanageable, jerking him from his mount. Sharp was thrown beneath the horses and his neck was broken. His home was at Cleveland and he was to have been married on Christmas day to a Cleveland girl.

Horace K. Havlicek, '16, died on November 30, from the effects of a gunshot wound received while on duty at Fort Sam Houston, Texas. Lieutenant Havlicek, formerly a major in the cadet regiment at the University, was appointed by the University to the army in 1916. He was assigned to the Sixth Cavalry, was promoted to first lieutenant in October, 1916, and was sent to Fort Sam Houston after six months of training at Fort Leavenworth, Kansas. His home is located at Berea, Ohio.

Hamlin C. King, '17, was recently married to Miss Edith C. Cole, of Springfield. They will live near Vanlue, in Hancock County, where Mr. King has been farming since graduation.

J. Byron Koontz, ex-'17, was married on November 27 to Miss Elizabeth Walters, ex-'20, at Calgary, Canada. They will live on the wheat ranch of Mr. Koontz in the province of Alberta, Canada.

Ralph W. Jordan, '14, is a vegetable grower and shipper near Lockwood,

Ohio. He is especially interested in the improvement of the muck lands in the northern part of the state.

Edwin H. Krause, '16, is employed by the Food Administration at Washington, D. C. He is a specialist in the manufacture and conservation of cheese.

Hugh G. Selby, ex-'19, was married on Thanksgiving Day to Miss Jessie L. Carran, of Lakewood, Ohio. Mr. Selby is assistant engineer of the American Steel and Wire Company's new plant which is being constructed near Cleveland.

Allen L. Baker, '17, was married December 5, to Miss Elizabeth Hopkins, of Columbus. Miss Hopkins was a stenographer in the department of agricultural extension. They will be at home on a farm near Cincinnati, where Mr. Baker is paying attention to the lard hog business.

George P. Samman, '14, has a good position with the bureau of markets at Cleveland, Ohio.

John Stratton, '17, is in the banking and brokerage business at Piketon, Ohio.

Ruth Greene, '16, is teaching home economics and music in the high school at Gibsonburg, Ohio.

Eva Nouse, '17, is teaching in the high school at Leroy, Ohio.

Josephine Jones, '17, who was the home economics editor on *The Agricultural Student* last year, is now secretary of the Y. W. C. A. at Ohio Wesleyan University at Delaware.

Uri F. Bruning, '16, is farming near Woodside, Wood County, Ohio, and making a specialty of sugar beets.

Ralph S. Christen, '17, who was editor of *The Agricultural Student* last year, has purchased several pure bred Holsteins and Berkshires as a foundation for his herds on the home farm at LeMoyne, Ohio.

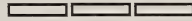
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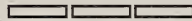
Farmers' Week

Jan. 28-29-30-31-Feb. 1

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100 Lectures and Demonstrations by
Leading Farm Authorities

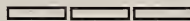


Annual Meetings of Ohio State Dairymen's Association, Ohio State
Horticultural Society, Ohio Vegetable Growers' Association, Ohio
Rural Life Association, Ohio Beekeepers' Association, Ohio
Percheron Breeders' Association, and Many Others.

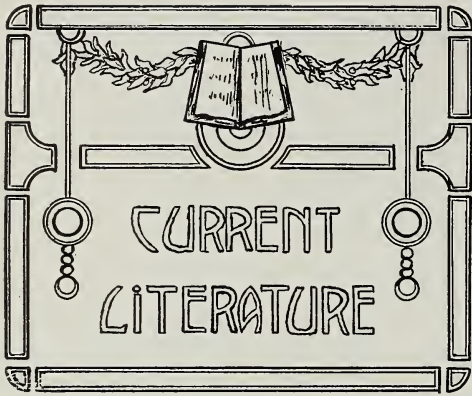


Ohio State Corn Show and
Annual Horticultural Exhibit

Write for Complete Program.



4046 FARMERS ATTENDED LAST YEAR.



“Popular Fruit Growing” is the title of the fourth revised edition of the book written by Samuel B. Green. This edition was revised by Le Roy Cady, of the University of Minnesota. This is a most practical treatise on fruit growing for colleges, schools and fruit growers. It leads the reader thru all the steps in establishing a modern fruit farm, from the selection of the location to the harvesting and marketing. Pruning, orchard protection, injurious insects and disease and spraying apparatus are all fully discussed. Following this there is a separate chapter on the pome fruits, stone fruits, grapes, small fruits, and nuts. The appendix contains a spraying calendar, insecticides, list of horticultural books and bulletins and rules for naming fruits. 328 pages, 132 illustrations. \$1.00. Webb Publishing Co., St. Paul, Minn.

“Vegetable Gardening” is the title of a book written by Samuel B. Green and recently revised by Le Roy Cady. This is one of the most popular texts in horticultural classes and is recognized as practical and authentic. Chapters on new varieties of plants, new methods of production, marketing, exhibiting and judging vegetables add much to the book and bring it up to date. A chapter on glass structures and one on injurious insects help to make the book

useful to all readers. Use of manures and commercial fertilizers in the vegetable garden is fully explained and discussed. The appendix contains much useful information, such as: weight of one quart of seed and the number of seeds in one ounce, amount of seed required to sow one acre, standards of purity and germination and a monthly calendar of garden operations. 336 pages, 137 illustrations, \$1.00. Webb Publishing Co., St. Paul, Minn.

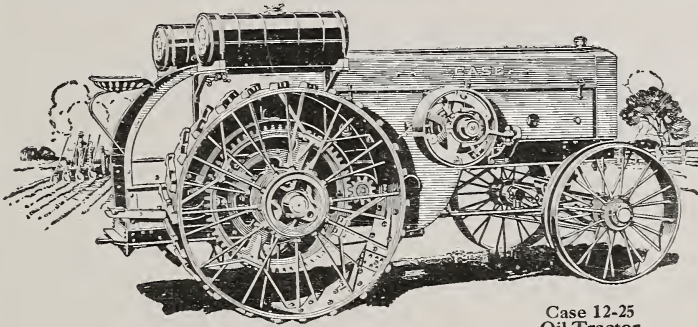
“Productive Feeding of Farm Animals” is the title of a book written by F. W. Woll, of the University of California. It is a systematic and practical treatment of a subject that is of fundamental importance. The first part deals with the principles of feeding and the composition of feeding stuffs. It also discusses the calculating of rations and the manurial values of the different feeds. The second part deals with the different feeds, their comparative values and usefulness to animals. In the third part, the productive feeding of all the various classes of animals is treated and explained. The book also has an appendix which contains tables for calculating rations and the manurial values as well as the weights and composition of all feeds. 398 pages, 106 illustrations. \$1.75. J. B. Lippincott Company, Philadelphia.

“Principles and Practices of Milk Hygiene,” by Louis A. Klein, of the University of Pennsylvania, is one of the latest books on this important subject. It is intended primarily as a text for students taking courses in milk hygiene, but it will prove of service to public health officials, dairymen and all others interested in the production of wholesome milk. Milk and the physiology of its secretion is discussed in detail followed by a study of bacteria and

(Continued on Page 311.)



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HIGH PRICED FEEDS AND THE FARM FLOCK

Comparison of the Price of Feeds and the Price of Eggs

A. B. DANN, Ohio State University, Columbus, Ohio

CHIEF interest in the care and management of the farm poultry flock for the past few months has centered almost entirely on the high cost of feeds. For the two years, 1915 and 1916, one standard ration for laying hens cost on the average \$1.87 per hundred pounds. This same ration for the past year (1917) averaged \$3.11 per hundred pounds—an increase of \$1.24 per cwt., or 66.3 percent.

On the other hand, the price of eggs for the past year has increased only 30.2 percent and the price of poultry but 26.5 percent over the average price for the two previous years. At first glance, it would seem that feed had increased in price out of all proportion to eggs and poultry. This, however, is not entirely true, as will be seen when one studies the subject from another viewpoint.

A manufacturer works out costs, selling price and profits on the basis of units, be it labor, materials, sales, or any other phase of his business. He is careful, however, to use the correct unit for such computations. Likewise should the farm poultry flock be considered on the unit basis. One hundred pounds of feed is not the unit of cost and the market price of one dozen eggs is not the unit of income. A hen does not require 100 pounds of feed to produce one dozen eggs; neither does she require a hundred pounds of feed to keep her one year. The hundred-weight of feed may be the unit of purchase but it is not the unit of cost of production. In the same manner the dozen of eggs is the unit of sales but it is not the unit of income.

The true unit of measure for determining whether the farm flock shall be decreased, maintained, or increased, during the coming season is the return from eggs over cost of feed per hen or per hundred hens per year. Other costs enter, it is true, but the amount of feed consumed is approximately constant whether the hen be kept in a brick mansion and fed by a millionaire or whether she be kept in an unused corner of the stable and fed by the farm boy. The hen is truly a machine; feed is the big item of necessary expense and eggs are the chief source of income. The unit of measurement is then the receipts from eggs over and above the cost of the feed which was required to produce them. For the present purpose this may be considered on the basis of "per hen per year."

The average hen, in a reasonably well-kept commercial flock, lays about 10 dozen eggs per year; in the same time she will eat approximately 75 pounds of grain and mash. For the average of the years 1915 and 1916, 75 pounds of the ration previously mentioned cost \$1.40 (100 lbs. at \$1.87). As an average of the same two years, the 10 dozen of eggs sold at 30 cents per dozen or \$3.00. This left a margin per hen per year of \$1.60 over feed cost.

For the past year (1917), 75 pounds of the same ration cost \$2.33 (100 lbs. at \$3.11). The 10 dozen eggs increased in value by 30.2 percent or to \$3.90. This left a margin of \$1.58 over feed cost for the past year as compared to the margin of \$1.60 over feed cost for the average of the two previous years.

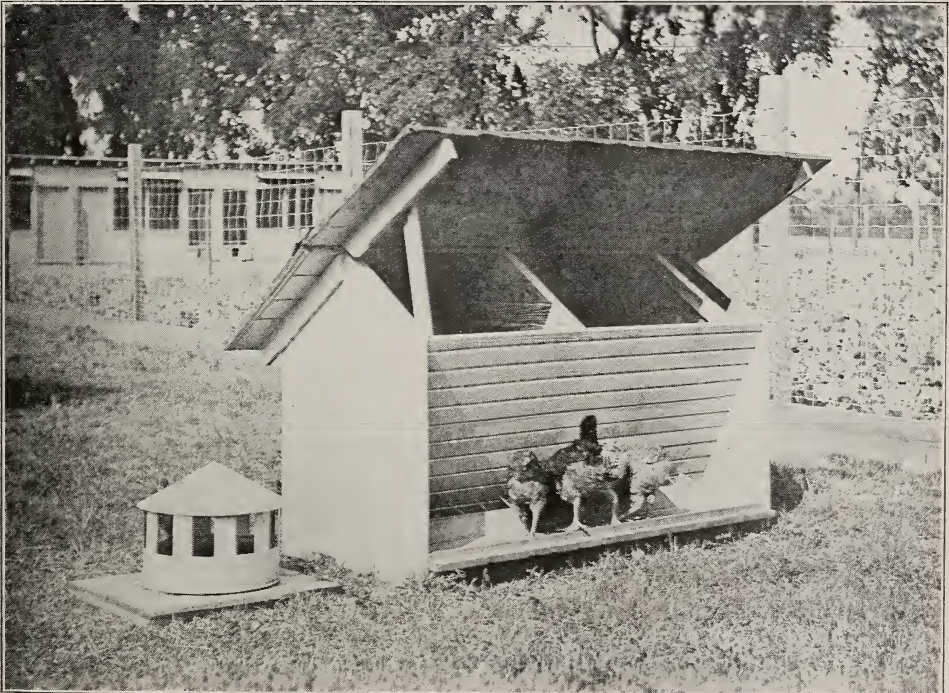
The increase in feed cost is, therefore, not materially out of proportion to the increase in the value of eggs, and there is yet a reasonable margin of profit to be gained from purebred, well selected hens correctly fed and managed.

The above figures would be lower, both as to feed cost and as to value of eggs, for average flock conditions on the general farm but the ratio would hold fairly true. In general, it may be stated that 100 percent increase in the price of feed is offset by 40 to 50 percent increase in the price of eggs. Or, when feed doubles in price, eggs need only increase $\frac{1}{3}$ to $\frac{1}{2}$ in price to offset.

Looking at the situation in the light of extra large crops the country over, of a material decrease in the number of hogs, cattle, and fowls, government regulation to prevent food speculation and agitation to eat more poultry and eggs, it is reasonable to suppose that feed will not increase in price sufficient-

ly to be inconsistent with the above ratio. Farmers and poultrymen should feel encouraged to continue with their present stock and plan to maintain if not increase the number of good, well-selected hens.

The ration to be used is largely a matter of local conditions, such as grains produced on the farm, available local supply, possibilities for cooperative buying, variety of birds to be fed, and methods of feeding. It is difficult to determine just what feeds are to be available at the most reasonable prices. The government has prohibited the exportation of wheat, the use of milling wheat in commercial scratch grains and the use of over 10 percent of feed wheat in commercial scratch grains. This should make the wheat milling by-products—bran and middlings—rather plentiful and reasonable in price. Because of a well matured wheat crop, good palatable feed wheat or screer-



Hens Should Help Themselves At All Times

ings bid fair to be scarce. Corn is said to be a bumper crop, and should be reasonable in price. Oats or barley or both will be available in most sections. Corn feed meal, which is the siftings from cracked corn and bolted meal, is now quite commonly used in place of corn meal, and most grades are equally as good. Gluten feed is palatable to hens and will undoubtedly furnish a cheap source of vegetable protein. Meat scrap is high in price and going constantly higher; it should not be left out of the ration, however, unless the hens have plenty of skimmed milk or buttermilk to drink (12 quarts per 100 hens per day). A good grade of feeding tankage may possibly be substituted for the meat scrap. When warmed in the hands or when boiling water is poured on a **good** meat scrap or feeding tankage, it will have the odor of fresh meat that has been scorched.

A "Standarized War Ration for Poultry" which to date has been adopted by several Eastern States—New York, Connecticut, Massachusetts, New Jersey, Rhode Island, Vermont, and West Virginia—is made up as follows:

Scratch grain consisting of: cracked corn, 500 lbs.; feed wheat, 100 lbs.; heavy oats, 200 lbs.; barley, 200 lbs.; with a mash mixture of wheat bran, 100 lbs.; wheat middlings, 100 lbs.; corn meal or hominy, 100 lbs.; gluten feed, 100 lbs.; crushed or ground oats, 100 lbs.; meat scrap, 100 lbs.

A good method of feeding is recommended as follows:

Scratch grain—Hand-fed in clean, dry litter 5 to 8 inches deep—scantly in morning to induce exercise, and more abundantly at night.

Mash mixture—Fed dry in hopper always open.

Green feed—Mangel beets, cabbage,

or sprouted oats fed at noon. Turnips and apples may be used to some extent.

Oyster shell, grit, and fresh water, always available.

The aim should be to so regulate the amount of grain fed that the birds will get equal parts by weight, of grain and dry mash.

Especially is it important this winter that ground feeds be fed in hoppers where the hens can help themselves at all times. The ground feeds are cheaper than the whole grains and it has been repeatedly demonstrated that egg production varies with the amount of mash consumed, rather than with the amount of grain. Feed the mash **dry**; it is far less work, less dangerous and gives equally as good if not better results. Home-made dry mash hoppers are entirely suitable and far cheaper than patented hoppers.

Professor W. J. Buss of the Ohio Experiment Station at Wooster has shown that for twenty weeks during the winter months, pullets fed entirely on grain showed a **loss** of 33 cents each. On the other hand, pullets fed a suitable dry mash during the same period showed a profit of 30 cents each. Many other experiments of a similar nature have shown results decidedly favorable to the use of dry mash in addition to grains. One cannot afford to keep even a few hens, without supplying dry mash as a regular part of their ration.

Wheat straw makes the best litter; oats straw is good, but tends to "mat" more quickly. Mustiness may be detected by chewing up a sample of the feed, and by the odor from the litter. Give the farm flock a fair show over the winter months, and instead of just "keeping themselves" they will pay their board and go a long way toward "keeping their owner."

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Tuition can be paid \$1.00 per week until paid.

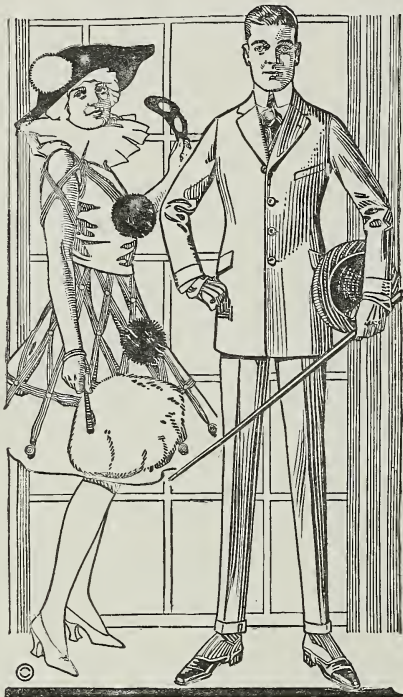
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Robert R. Barker, '16, is with the department of farm management at the Ohio Agricultural Experiment Station at Wooster.

Clyde L. Rose, '14, and Harold Rose, ex-'17, are operating a farm near Grafton, Ohio.

Arthur G. Abbott, '99, is paying special attention to the raising of pure bred Jerseys and Percherons on his farm near Wadsworth, Ohio.

Walter S. Donaldson, '17, was married on Thanksgiving Day to Miss Eva Gray, of Zanesville. Mr. Donaldson is teaching manual training in the high school at Kent, Ohio.

The following students in the college of agriculture have left school to go into the branch of service indicated:

Harry L. Gibbons, sophomore, navy; James H. Houser, junior, navy; Frank J. Scheel, senior, enlisted; Russell R. Clymer, sophomore, drafted; C. Victor Kendall, junior, drafted; N. Neal Luxon, sophomore, enlisted; Lewis S. Pence, senior, radio; Guy F. Jump, senior, radio; Glenn E. Coe, junior, radio; David G. Wing, sophomore, radio.

Stanley Evans, junior, radio; Frank M. Long, senior, radio; Raymond C. Sheppard, sophomore, enlisted; Charles Nussbaum, sophomore, enlisted; Gardner W. Burbank, sophomore, radio; Edward M. Caldwell, senior, radio; William F. Burbank, senior, radio; William J. Grafft, freshman, radio; Lawrence N. Spencer, sophomore, radio.

Alvin W. Barr, junior, aviation; Thomas G. Allen, junior, radio; Edwin F. Cauffield, sophomore, radio; Alvan C. Thompson, senior, navy; Kenneth L. Ewart, senior, radio; George E. Evans, senior, enlisted; Nelson B. Troth, freshman, army; Robert H. Spiers, sophomore, aviation; Wayne C. Blaser, freshman, enlisted.

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For the first time since we went into the business, we are worried because we fear that our stock of seed corn is too small for this year's requirements. It was not our fault, because we had out a very large acreage but premature frosts and hard freezes eliminated large blocks that were meant for seed. We have a moderate supply of every stock quality. Corn that will germinate 98 per cent. This corn is all pedigreed, includes our famous Improved White Cap and 120 Day Yellow, both of which have taken a prominent part in Ohio, and winning state contests. Also limited stocks Minnesota 13, the best very early corn we believe that has ever been introduced into the state.

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BREEDING PURE BRED HOGS

W. E. HARPER, '20

IF we review the records of the pure bred hog industry we will see where many men have failed and many have been successful. The records do not show why some failed nor why some made a success and it leaves in the mind a question of the soundness and stability of the business. All kinds of business are given to specialization, competition and aggressiveness. The hog business is no exception and the man who understands the business is sure of a reward.

Locality is the first consideration in this industry. Climate, natural drainage, mineral content of the soil and railroad facilities are all important factors. If the swine are subjected to great variations in temperature, abundance of shelter and shade should be provided. If hogs are kept in great numbers, large amounts of disease-creating waste will be produced which should be carried away either by artificial or natural means. It is much better if the soil contains several kinds of minerals which are needed for the growth of the hogs and the production of disease resisting bodies. One should choose a farm which has good railroad facilities as this will bring buyers and eliminate long hauls.

The selection of type should be determined more by locality than by fancy. Lard hogs are suitable for the corn belt and the bacon type where protein foods are the cheaper. Two things should influence the selection of a breed: local demands and the likes or dislikes of a breeder. A breeder is more likely to succeed with the breed he likes, but the prevailing breed in a locality is always to be considered.

When the type and breed has been

selected, a study of the deficiencies of that particular hog should be made. Hogs developed in the corn belt, where the carbonaceous feeds are abundant and the proteins more or less deficient, tend to become fat, lose size and prolificacy. The breeder should develop size, constitution, vitality and prolificacy.

The size of the hog is a feature not generally given proper emphasis because the hog market pays a premium on hogs weighing from 175 to 300 pounds. With this in mind, most pork producers can not see the necessity or value of the 600 to 1,000 pound hog. A little experience with the big type will prove that they reach a market weight with a greater weight for pound of feed consumed than the smaller hog. The ability of the hog to be fitted for market before reaching maturity has been developed to too great an extent resulting in a smaller type, less prolific hog.

Prolificacy is another factor that must be considered in breeding pure bred hogs. The brood sow that raises 10 pigs is more than twice as valuable as the one that raises only 5 in a litter. Prolificacy is an inherited characteristic, but it is influenced by feed and care.

Quality is not good conformation nor does it apply to the condition of the animal. It is a term that may be applied in the same sense as it is used in speaking of cloth, whether coarse or fine, good or poor. A close study of the hog, the markets, and the demands of the farmer and consumer should bring an ambitious individual to success. The future demands will cause many new men to enter the pure bred hog business. There is plenty of room and the men in the business welcome the new and constructive breeders.

GREENHOUSE DISEASES.

Greenhouse soil annually renewed produced head lettuce with the smallest loss from disease at the Ohio Experiment Station. Sterilization of the soil with formalin checked the diseases but the differences were not marked in any case.

Twelve percent of the plants have been diseased in the ordinary soil of the greenhouse in the last five years. Steam sterilization has been of little value in preventing disease and a sand cover over the plot has increased disease conditions.

Greater progress can be made by plant selection of head lettuce than by the soil treatment. Some varieties at the Experiment Station have shown less than four percent loss from disease.

FUMIGATION CHECKS LICE.

Fumigation with tobacco stems or a nicotine preparation has been found to be the cheapest and most effective means to rid a greenhouse of aphids. About a pound of tobacco stems to a thousand cubic feet of space is necessary to form a smoke that will kill the aphids. If dry stems are first started with paper, and damp stems are then piled on the fire, a greater amount of smoke will result. Most satisfactory results are reported when the treatment is started in the evening. One fumiga-



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tion per week will keep the greenhouse free from aphids according to specialists at the Ohio Experiment Station.

KILL THE RATS.

The annual board bill of the average rat is above one dollar. There is at least one rat for every person, and the total bill will be over \$100,000,000 per year. Much of this waste could be prevented by rat-proof bins and cellars. The most successful trap is the spring trap which kills the rat almost immediately.

Barium carbonate is one of the best poisons to use and it can be secured at any drug store. It operates slowly and the animal will leave the building to die. The poison may be prepared by mixing one tablespoon of barium carbonate to eight tablespoons of oatmeal and adding water to make a stiff dough. Small quantities should be put in the places which the rats frequent.

SPREAD MANURE THIN.

Manure returns most per ton when spread lightly over a large area rather than heavily over a small area. Increasing the quantity per acre does not result in corresponding gains in crop yields.

When 4 tons of manure was applied to wheat in a three year rotation with potatoes and clover at the Ohio Experiment Station, the yield was 45.58 bushels per acre which was 10.92 bushels more than unmanured $\frac{1}{2}$ and. An eight ton application returned an increase of 16.13 bushels so that doubling the amount of manure increased the gain in wheat only 48 percent.

WOMEN AS AGENTS.

Emergency appropriations recently made by Congress provide funds for the employment of a home demonstration agent both in cities and rural communities. This agent gives lectures

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This work is done in cooperation with the schools of the county in their school lunch work and the boys' and girls' clubs. Her services are also available as an adviser to county authorities on all questions of food, sanitation and health in county institutions.

During the period of the war, she will give attention to the problems growing out of the situation and will aid the community in its efforts to cooperate with the state and national agencies.

The work of such an agent with the women corresponds to that of the county agricultural agent with the men, and her efforts is maintained in connection with that of the county agricultural agent. Information about obtaining one of these agents may be had from the Agricultural College Extension Service, Columbus, Ohio.

SAVE THE WHEAT.

Substitution of other grains for wheat in poultry rations will save 100,000,000 million bushels of wheat now annually fed to poultry and divert it into channels for human consumption. The United States department of agriculture has been feeding a wheatless ration in its experimental work at Beltsville, Maryland, with favorable results. The ration consists of a scratch mixture of 2 pounds of cracked corn and 1 pound of oats and an equal quantity of dry mash consisting of 3 pounds of corn meal and 1 pound of beef scrap. A flock of 30 Leghorn pullets produced an average of 147.3 eggs during their first laying year on this ration.

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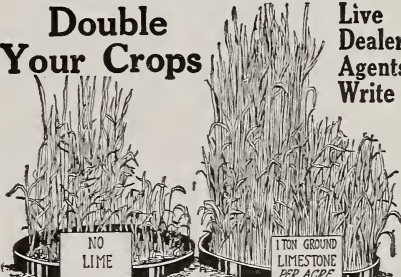
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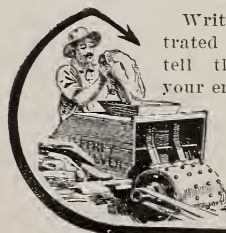


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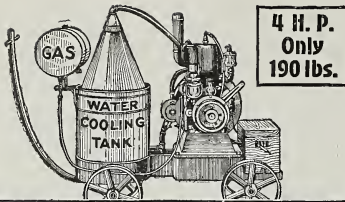
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Western Office, Milwaukee, Wis.

ANNUAL CORN SHOW.

The tenth annual Ohio State Corn Show will be held during Farmers' Week, January 28 to February 1. Because the north end of Townshend Hall, where the show has been formerly held, is now occupied by additional offices of the extension department, it will likely be held in the Horticultural and Forestry Building.

Classes will be open for students and farmers separately and in addition to the display of corn, a number of small grains and potatoes will be shown. Soy beans will form a prominent part of the exhibit this year. Farmers and students are urged to cooperate to make this show interesting and instructive.

FIGHTS HOG CHOLERA.

Seven graduates of the College of Veterinary Medicine have been employed by the bureau of animal industry of the United States Department of Agriculture in a campaign for the elimination of hog cholera in Western Ohio. The work was made possible by a special appropriation of funds for this purpose. Dr. L. P. Beechy of the department of agricultural extension has charge of the entire force of nine field veterinarians who have charge of 42 counties.

EXPERIMENT STATION CROP.

The apple crop of over 2000 bushels which was harvested at the Ohio Agricultural Experiment Station was nearly all first grade and sold at \$1.50 per bushel. Typical samples of all the best varieties were sent to the Ohio State University for class room work. Smaller collections were sent to high schools in the fruit-growing sections of Ohio and to agricultural colleges in several other states.

(Continued from Page 294)

is light and fluffy, stiffen with white flour and finish as usual. The addition of any of these other materials reduces the volume of the loaf, modifies the color, texture, and flavor altho the nutritive value is much the same.

Taste may be trained and cultivated as well as any of the other senses. So if we still long for our plain white bread after eating the liberty bread, we may try and try again for the sake of world democracy. We must remember that the people in Europe are doing the fighting and the suffering and at the same time are eating bread that contains much less wheat flour than ours and oftentimes none at all.

Continued from Page 295.)

It is considered that Mr. Vick has the most convenient washing room and the most complete set of tools of any gardener in the vicinity of Columbus. His washing room is cemented and has a shed on one side where the wagon is placed so that the vegetables may be loaded directly from the washing room without any extra work.

Mr. Vick has been in the business practically all of his life, having been with his father eight years before he began for himself. He is now a member of the Market Growers' Association which was recently organized.

(Continued from Page 298.)

other diseases that affect milk. Dairy farm inspection, pasteurization and the methods of examining milk, each form an important chapter. The appendix contains rules and standards for the production of certain kinds of milk. 328 pages, 41 illustrations. \$1.75. J. B. Lippincott Company, Philadelphia.

Quickest Growth of Corn

Secured by Using Tower System of Culture.

Every farmer desires the quickest possible growth of corn, to lessen danger of damage from late summer drouths and early fall frosts. Quick growth is possible only with large development of root systems. Not a rootlet should be cut off, as every root lost means just that amount of check to growth. Every new root made by the plant to replace cut-off roots is developed from materials drawn from the growing corn plants. Plants can grow only as fast as their root systems develop.

Corn roots spread out near the surface. J. D. Tower dug up many corn plants to find the spread of their roots. This cut illustrates what he found:



These Corn Roots Within Five Inches of the Surface.

A system of cultivation right for many kinds of plants is wrong for the corn plant. So-called "plowing" of growing corn cuts off many roots and delays growth, often causing the corn to be so late that it is caught by frost before maturity. Result: corn unmarketable and low in feeding value because deficient in starch and phosphoric acid.

The Tower System of Cultivation prevents injury to corn roots and hastens growth.

The Tower Cultivators are designed for shallow cultivation, to kill weeds and make a dust mulch, thus preventing evaporation of soil moisture and letting in the oxygen for use of the corn roots.

Send for FREE Tower literature on corn cultivation.

Our cultivator bears the name of "TOWER" on the tongue.

The J. D. Tower & Sons Co.

MENDOTA ILLINOIS.

(Original manufacturers of surface cultivators)

PIMENTO CHEESE AT OHIO STATE

E. L. SHUCK, '18

THE manufacture of pimento cheese has been very profitable to the dairy department of the Ohio State University," says Mrs. Haines, dairy cashier. During the past year 36,406 pounds of whole milk and 364 pounds of skim milk have been used at a total cost of \$757.64. From this amount of milk 27,508 glasses of cheese were made as well as 58 pounds in the bulk which were sold for \$2,487.72.

In the manufacture of pimento cheese the first and prime essential that is required by the dairy department is a good quality of milk, as good cheese cannot result from poor milk. The milk should test at least 4 percent butterfat, while 5 percent milk will make a cheese of superior quality. The milk is first pasteurized by heating it to 145 degrees F., holding it at that temperature for one-half hour and then cooling it to 75 or 80 degrees. Then the milk is inoculated by adding one quart of starter to a 10-gallon can of milk. At this stage $1\frac{1}{2}$ cubic centimeters of rennet diluted in about 30 cubic centimeters of water is added. Then the mixture is agitated well for about two or three minutes so as to be uniformly distributed in all portions of the can.

The mixture should remain at a temperature of 75 degrees F. from 18 to 24 hours, varying somewhat according to the surrounding temperature. That is, if the latter is below 75 degrees, the milk is allowed to set longer, and vice versa, this being due to the fact that as the temperature rises (up to a certain limit) the ripening process is hastened. However, from 80 to 85 degrees is the best temperature for lactic acid bacteria to propagate. Then the contents of the

cans are poured into cheese cloth sacks in such a manner as to leave the curd in as large chunks as possible. The sacks are hung in a draining tank and left to drain for about 12 hours. The entire curd is retained in the bags while the whey is drained off.

The curd is then weighed. For every 8 pounds of curd, use one pint of pimentos, which have previously been finely ground, and for every 10 pounds of curd use 3 ounces of salt. The constituents are then thoroly mixed and ground fine by means of a power grinder, emerging from the machine in small twine-like threads. It is then prepared for commercial use in 6-oz. glasses, special care being exercised in filling the glasses so as to exclude all the possible air bubbles from the contents of the container. A spiral-cut paper is then placed on top of the glass and the tin lid is put in place. A gummed label, stating the name and weight of the product and the name of the manufacturer, is sealed on top so as to firmly bind the lid to the glass.

The sales of pimento cheese are made wholesale as well as retail, about two-thirds being sold to the groceries in the central part of the city as well as the central market, and the remaining one-third is sold directly from the sales-room. For 1-pound lots a price of 30 cents is charged while for 5 pounds or over the price is 25 cents per pound. When sold wholesale, it brings \$1.20 per dozen, but when retailed pimento cheese brings 12 cents per glass.

"Our sales could be increased by at least 40 percent," says Mrs. Haines, "by extending our deliveries to the more distant sections of the city."



This Calf Pays Five Times Its Feed Cost

Raising calves on whole milk is out of date. It is throwing away good money—costs you from \$30 to \$40 to bring the animal to five months old. Sucrene Calf Meal saves you from \$25 to \$30 in feed cost—enables you to sell or use nearly all the cow's milk. The calf thrives better, grows faster, with less chance of setback or sickness. *Let us tell you why.*

Sucrene Calf Meal

The Most Perfect Calf Food Science Can Produce

It is unlike any other calf meal on the market. Contains ingredients not found in any other, but which the calf must have for health and growth.

Sucrene Calf Meal is the most perfect substitute for whole milk on the market because it contains soluble blood flour, a strong protein food and one of the most effective bowel correctives—prevents scours; bone meal, which builds up big, strong frames; soluble starch and malt flour, which supply the necessary sugar in the most digestible form—now generally prescribed by physicians for human babies in preference to milk sugar; dried skim milk, which contributes the rare and mysterious life-giving material known as "vitamine," absolutely necessary to the young animal's full development.

The foregoing ingredients, with corn feed meal, linseed meal and flour middlings, constitute a complete food for the young calf. Its quality never varies, as does that of cow's milk, therefore insuring the steady healthy growth of the calf.

Sucrene Calf Meal can be prepared in a few minutes. Full feeding directions in every sack.

Order a trial sack from your dealer. You will find it the best feed investment you ever made. If he does not handle Sucrene Calf Meal write us his name and we will see that you are supplied.

Write for our Free Book on Calf Raising. Contains reliable information on every phase of the subject. Will save you money and trouble.

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(16 Years America's Leading
Mixed Feed Specialists)

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Cutaway Double Action (CLARK) Disk Harrow

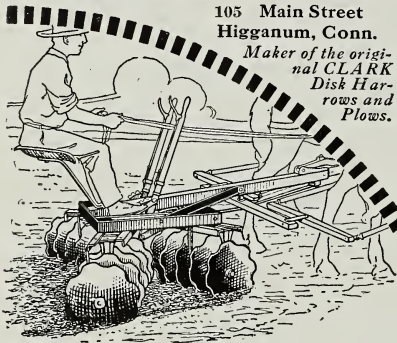
The rigid main frame makes the forged disks double cut, pulverize and level the ground. Closehitch. Lightdraft. All sizes.

Write for book telling how to raise better crops with less cost. "The Soil and Its Tillage," it's free, also new catalog. Ask for name of nearest dealer.

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*Maker of the original CLARK
Disk Harrows and
Plows.*



Free!

A 50-gallon barrel of Scalecide free to any one who will suggest a **fairer** guarantee than that given below.

"SCALECID"

As proof of our confidence and to strengthen yours, we will make the following proposition to any fruit grower of average honesty and veracity:

Divide your orchard in half, no matter how large or small. Spray one-half with "SCALECID", and the other with Lime-Sulfur for three years, everything else being equal. If at the end of that time, three disinterested fruit growers say that the part sprayed with "SCALECID" is not in every way better than that sprayed with Lime-Sulfur, we will return you the money you paid us for the "SCALECID".

Send for new free booklet,
"Profits in Fall Spraying".

B. G. Pratt Co., Mfg Chemists
50 Church St. Dept. 50 New York

ACID PHOSPHATE RETURNS.

At the experiment farm at Strongsville, acid phosphate in competition with rock phosphate has returned in crop yields 10 times its cost for the last 13 years. Two applications of floats totalling two and one-half tons have been made per acre in this period, while crop yields have been kept on the same level by three applications of 320 pounds of acid phosphate in addition to two applications of limestone amounting to five tons.

The floats cost \$25 and returned about \$80 in the amount of crops produced. Acid phosphate costing \$6.72 and limestone costing \$15 increased the value of the produce \$71 over the yield produced by liming. Floats increased the wheat crop of 1917 by 18 bushels which would pay all of the cost of fertilizer for 13 years and half as much more. Acid phosphate in the same crop produced 12¼ bushels of wheat over the yield produced by liming, worth three times the cost of the fertilizer for 13 years. Altho both were profitable, acid phosphate was far ahead of the raw rock phosphate.

Albert W. Nettleton, '98, is farming at Medina, Ohio, and is the proud possessor of a fine herd of Shorthorns.

Max M. Phillips, '16, is superintendent of the Canton Pure Milk Company at Canton, Ohio.

Charles A. Carran, '16, is a deputy state examiner of public records at Cleveland, Ohio.

Harry U. Simmermacher, '15, is superintendent of the Daisy Hill farms at Chagrin Falls, Ohio.

H. W. Zuercher, '16, who began teaching agriculture and coaching athletics in the high school at Creston, Ohio, this fall has transferred to the high school at Wooster where he will teach the remainder of the year.

Feed that means More Milk at Less Cost

You who get just an average yield of milk from your herd fed with expensive grain will be interested in a feed that costs less and will increase the flow from each cow by one to two quarts per day.



International Special Dairy Feed

will do that and more. It will keep your cows healthy and happy. It is a palatable, appetizing and stimulating feed for them, blended from choice grain products, molasses and cottonseed meal. Corn and oats cost much more and are not so healthful and efficient. International Special Dairy Feed can be mixed with home grown grains or fed as an entire grain ration and it will be profitable any way you use it.

Order Before It Is Too Late

You will need this economical food next winter. Get it now before the freight congestion and while our continually grinding mills can ship it. See your dealer today. Write us if there is no dealer near you, but act now.



International Sugar Feed Co.
Minneapolis, Minn. Mills at Minneapolis and Memphis

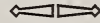
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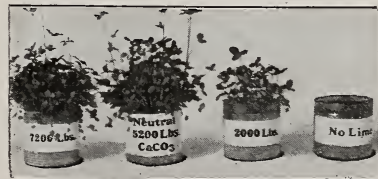


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It took good sows and good boars to produce them. They came from ancestors of the **big type**. Those smooth quick feeders with strength, big bone and good action. Capable of doing their own harvesting for a large part of food from blue grass, clover and alfalfa pastures.

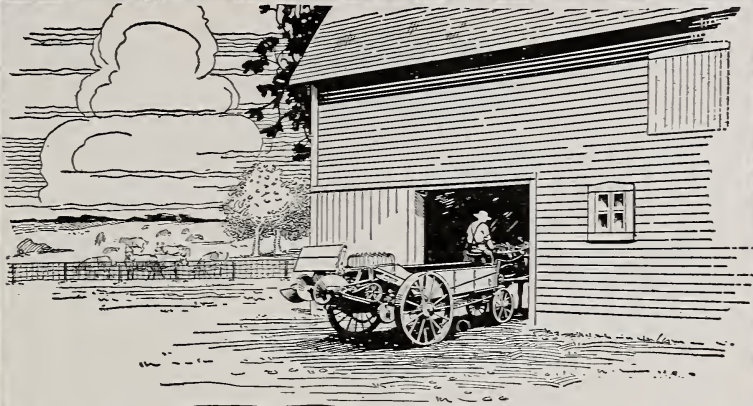
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THIS year—if you own no spreader, you are not only losing out on the bigger yields and profits that should be yours, but you are contributing to a billion-dollar manure waste, and stopping your ears to the world-call for food.

We have facts and figures to show that in scores of cases the use of an International Harvester spreader has added to crops more than enough to pay for the spreader in one year.

The dealer will show you the new **No. 8 Low Corn King, Cloverleaf or 20th Century**. This is the latest International Harvester spreader, the popular 2-horse, light-draft, narrow-box machine with the remarkable new spiral wide-spread. For the small-to-average farm this is bound to be the spreader success of the year. Look it over from tongue to spiral, see it at work, and you will agree with us.

In the **Low Corn King, Cloverleaf and 20th Century** lines are larger spreaders too, with disk or spiral wide-spread, all of narrow, easy-handling width; low, of remarkably light draft, strongly and simply constructed. Write us for catalogues and see the local dealer for a satisfactory money-making **Low Corn King, Cloverleaf or 20th Century** spreader.

International Harvester Company of America

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When You Judge a Milk Cow

you consider among other points the quantity and the quality of her milk. Check up the results of

Indian in Circle



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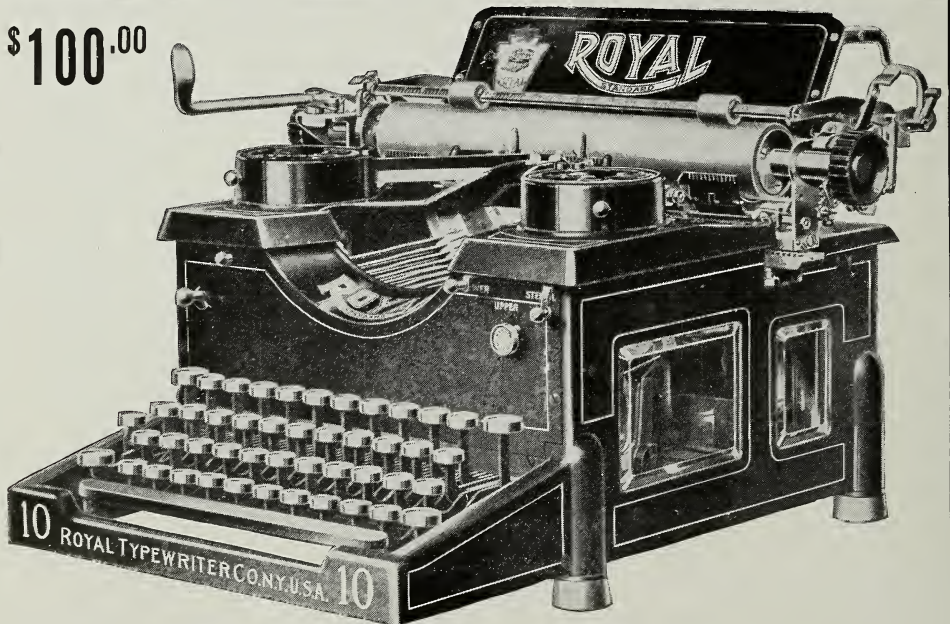
in the same way. Consider how much cleaning a little of it will do. Then test and determine how well it does it, and you will readily appreciate why Dairy Colleges and Dairymen the country over say, "The habit of using Wyandotte Dairyman's Cleaner and Cleanser is a profitable habit."

This cleaner is guaranteed to give you satisfactory service, or cost you nothing. Order from your supply house. It Cleans Clean.

The J. B. Ford Co., Wyandotte, Mich., Sole Mfrs.

IT CLEANS CLEAN

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**The Herd With the Production Back of Them—
Three of Our Cows Have Produced Over
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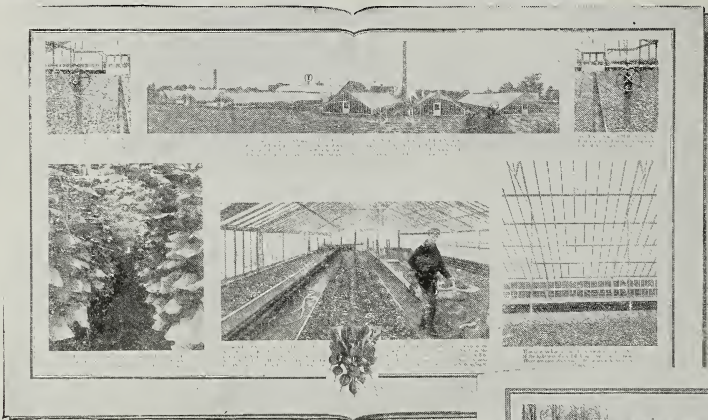
Four daughters of our herd sire at an average age of 2 years, 4 months and 22 days, produced 16,528 pounds milk, 813.5 pounds of fat in a year.

We have 15 daughters from cows with records of over 1,045 pounds of butter and 24,000 pounds of milk.

We have 13 daughters of 30-pound cows.

Write for information concerning our young stock.

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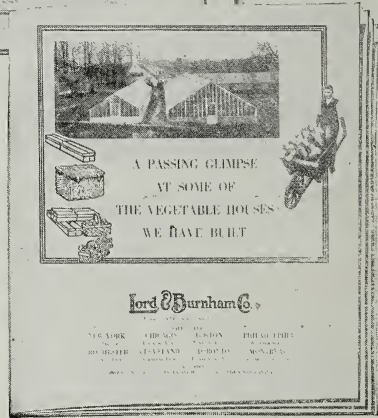


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